NATURAL AND CULTURAL RESOURCES MANAGEMENT PLAN

and environmental assessment

PINNACLES

National Monument
California

Prepared by
PINNACLES NATIONAL MONUMENT

DECEMBER 1983 REVISION

NATURAL AND CULTURAL RESOURCES MANAGEMENT PLAN

AND

ENVIRONMENTAL ASSESSMENT

PINNACLES NATIONAL MONUMENT

Prepared by: Pinnacles National Monument
National Park Service
Department of the Interior

December 1983

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FINDING OF NO SIGNIFICANT IMPACT

Department of the Interior

National Park Service

PINNACLES NATIONAL MONUMENT

California

Western Region

In compliance with the National Environmental Policy Act of 1969, the National Park Service has prepared an environmental assessment on the following proposed project:

Natural and Cultural Resources Management Plan
Pinnacles National Monument

The assessment process did not indicate a significant environmental impact from the proposed action. Consequently, an environmental statement will not be prepared.

12/14/83
Date

Rockwell P. Broyles
Superintendent

12/21/83
Date

Howard H. Chapman
Regional Director, Western Region

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ABSTRACT

The Natural and Cultural Resources Management Plan describes the natural and cultural resources of Pinnacles National Monument, threats to these resources, and resource management actions required to comply with the National Park Service Organic Act of 1916 and other applicable resource and environmental laws, regulations and Executive Orders. In effect, these actions have been established to restore and/or preserve natural ecosystems and processes and cultural values.

Proposed natural resource management actions include a prescribed burning program aimed at reducing the fire hazard posed by continuous mature chaparral using prescriptions that allow reproduction by native species; stabilization and prevention of soil erosion, improvement of existing trails to protect monument biota; fencing of monument boundary to reduce trespass and prevent movement of feral hogs into the monument; control of exotic plants, monitoring air quality, monitoring the impact of climbers on monument rock formations and vegetation, establishing a joint land management program with the Bureau of Land Management; and the completion of two wilderness trails that will provide improved access to, and management of, wilderness areas of the monument.

Proposed natural resources oriented research includes studies of the vegetation, endangered species, feral pigs, insects, aquatic resources, mammals, reptiles, soils, and birds. Each study will focus on population numbers, distribution, and interrelationships with other resources, both biological and physical.

Water resource management actions include the development of a water resources management plan for the entire monument and the study of the 100-year floodplain for the Chalone Creek-Bear Creek drainages.

Cultural resource management actions include the collection of artifacts from known and newly discovered archeologic sites; surveys of historic and archeologic sites; excavation of several accessible archeologic sites; adequate storage of collected artifacts; and the development of two interpretive displays about the history of the monument.

I. INTRODUCTION

MICROFILM

I. INTRODUCTION

A. Purpose

The preservation of natural and cultural resources within Pinnacles National Monument (PINN) is essential for its continued use and enjoyment by park visitors. PINN's Master Plan (1976), Final Environmental Statement for the proposed Master Plan (1975), Statement for Management (1980), Land Acquisition Plan (1980), and Wilderness Plan (1976) established the broad conceptual base for more specific resources management actions to follow. This document is an expanded and updated version of the 1976 Natural Resources Management Plan and Environmental Assessment and will guide park managers in achieving the resources management goals and objectives set forth in the 1976 Master Plan and the monument's 1980 Statement for Management.

The Natural and Cultural Resources Management Plan is a comprehensive statement that addresses the natural and cultural resource issues of Pinnacles National Monument. The Plan documents the current status of the resources and threats to these resources, and presents relevant research, monitoring and management programs and projects. The plan addresses those actions which must be pursued by the National Park Service to preserve the natural and cultural resource values of Pinnacles.

The Plan will be revised and updated annually to address the changing resources management needs of the monument and to retain its flexibility and usefulness to management.

B. Legislation Affecting the Plan

The first step toward protecting the resources of Pinnacles was taken in 1906 when over 14,000 acres were set aside as a National Forest Preserve. In 1908, a Presidential proclamation established Pinnacles National Monument to "... [reserve] the formations and caves...." At that time, the monument encompassed about 2,080 acres. Since then, the boundaries of the monument have expanded by Presidential proclamations and subsequent land acquisitions to include approximately 16,250 acres.

As stated above, the monument's original proclamations set Pinnacles aside to protect the scientific values of its pinnacles rocks and adjacent caves. The National Park Service Organic Act of 1916 added the purpose of providing for public use and enjoyment and broadened protection to include park scenery, natural and historic objects, and wildlife. All resource planning activities must insure that public use facilities do not disrupt or damage resources to a degree whereby their ability to serve future visitors is reduced, that appropriate non-destructive public use and enjoyment of resources is made possible, and that conscious care and protection are provided to conserve natural and cultural park resources.

In addition to the above proclamations and Organic Act, the following legislation currently affects natural and cultural resources management in the monument:

* The Wilderness Act of 1964 requires all Federal land-managing agencies to re-examine their resources for possible wilderness classification. All lands within the monument have been evaluated for placement in the National Wilderness Preservation System. Based on these evaluations, a Wilderness Plan has been implemented.

* The Endangered Species Act of 1973 requires all Federal agencies to consult with the Secretary of the Interior on all projects and programs having potential impact on endangered flora and fauna. The legislation further requires Federal agencies to take "... such action necessary to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species which is determined ... to be critical."

* Executive Order 11987 states that "executive agencies shall, to the extent permitted by law, restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States.

* Section 208 of the Federal Water Pollution Control Act Amendments of 1972 dictates that Federal areas are subject to State and local water quality regulations. Thus, Pinnacles must meet California State water quality standards.

* Under the Clean Air Act Amendments of 1977, 80 percent of the monument was designated a Federal Class I area. This means that visibility within the park is not to be impaired by any man-made source, and that methods must be devised to monitor such visibility.

* The National Historic Preservation Act of 1966 requires all Federal agencies to inform the Advisory Council on Historic Preservation of the effect of any undertaking on any district, site, building, structure, or object that is proposed for, or included in, the National Register and to afford the council a reasonable opportunity to comment. This Act was amended in 1980 to expand elements of cultural resources protection which will apply to Pinnacles National Monument.

* Executive Order 11593 (1971) directs Federal agencies to survey all properties under their administration that might qualify for listing in the National Register of Historic Places, and nominate them to the Secretary of the Interior to take measures which would result in the "protection and enhancement of the cultural environment."

* The Archaeological Resources Protection Act of 1979 (P.L. 96-95), supersedes the Antiquities Act of 1906. This act: (1) established that archaeological resources on public and Indian lands are protected, (2) established the permit requirements for resource excavation or removal and (3) established civil and criminal penalties for their illegal removal.

C. Management Objectives

Natural and cultural resources management planning is based on management objectives, or a framework, within which resource preservation and use can be continually evaluated. Management objectives related to natural and cultural resource values and current and proposed management actions include the following:

* Permit in wilderness and potential wilderness portions of the monument only those activities consistent with wilderness management policies.

* Eliminate exotic plant and animal species from the monument when it has been determined that such species threaten resources preserved in the park.

* Eliminate trespass grazing and poaching.

* Monitor indigenous mammal populations and implement appropriate management actions whenever any population increases to a point that it becomes a public nuisance, a vector for the spread of disease, or a threat to the well-being and general health of the total population of the species.

* Identify and inventory natural biotic communities in the Pinnacles. Identify, and, if necessary, reintroduce natural processes which influence age structure, distribution and species composition in these communities.

* Make the visitor aware of the susceptibility of the monument's natural resources to degradation through the acts of man.

* Identify and appropriately manage the monument's archeological sites.

* Preserve, protect, and permit appropriate uses of the monument's historic structures through the application of appropriate preservation measures.

* Remove development, to the extent possible, from prime resource areas and from areas where they present a visual intrusion on prime resource areas.

* Adjust boundaries to coincide with watershed or other appropriate natural subdivisions.

* Cooperate with Federal, State, and County agencies and private interests in all matters of regional planning, management and use of resources which might affect the natural, historic, and scenic values in and near the monument.

D. FIVE-YEAR NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAMMING SHEETS

PINNACLES NATIONAL MONUMENT
February 1983

N/CRMP Priority	Project Number	Project Title	FUNDS IN THOUSANDS FY 1983 Base	FY 1983 New	FY 1984 Base	FY 1984 New	FY 1985 Base	FY 1985 New	FY 1986 Base	FY 1986 New	FY 1987 Base	FY 1987 New	10-237 Increase No. and Date	10-238 Pkg. No. and Date	Park Priority
1	RM-2	Prescribed Burn Program	26		26		26	30	26	30	26	30	44( )		
2	RM-11	Boundary Fencing	40			280		280		15		15	*	129(1/81) Rev. 1	
3		Trail Stabilization and Rehabilitation						65		65				420(12/82) 408(6/79) 417(12/82)	
4	N-8	Feral Pig Study	10		5		8								
5	N-1	Plant Inventory	8		5		2								
6	C-1	Historic Site Protection													
7	RM-14	Wilderness Program with BLM	1		1		1	1	1	1	1	1	44( )		
8	RM-1	Fire Protection Agreement	2		2		2	1	2	1	2	1	44( )		
9	WR-2	East Floodplain Study	19												

* 10-237B for patrol, routine repair of fence and hog removal (if indicated) will be submitted with FY86 budget requests.

D. FIVE-YEAR NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAMMING SHEETS

PINNACLES NATIONAL MONUMENT
February 1983

N/CRMP Priority	Project Number	Project Title	FUNDS IN THOUSANDS FY 1983 Base	FY 1983 New	FY 1984 Base	FY 1984 New	FY 1985 Base	FY 1985 New	FY 1986 Base	FY 1986 New	FY 1987 Base	FY 1987 New	10-237 Increase No. and Date	10-238 Pkg. No. and Date	Park Priorit
1	RM-2	Prescribed Burn Program	26		26		26	30	26	30	26	30	44( )		
2	RM-11	Boundary Fencing	40			280		280		15		15	*	129(1/81) Rev. 1	
3	RM-19	Trail Stabilization and Rehabilitation						66		16				420(12/82) 408(6/79) 417(12/82)	
4	N-8	Feral Pig Study	10		5		8								
5	N-1	Plant Inventory	8		5		2								
6	C-1	Historic Site Protection													
7	RM-14	Wilderness Program with BLM	1		1		1	1	1	1	1	1	44( )		
8	RM-1	Fire Protection Agreement	2		2		2	1	2	1	2	1	44( )		
9	WR-2	East Floodplain Study	19												

* 10-237B for patrol, routine repair of fence and hog removal (if indicated) will be submitted with FY86 budget requests.

D. NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAMMING SHEETS (cont.)

PINNACLES NATIONAL MONUMENT
February 1983

FUNDS IN THOUSANDS

N/CRMP Priority	Project Number	Project Title	FY 1983 Base	FY 1983 New	FY 1984 Base	FY 1984 New	FY 1985 Base	FY 1985 New	FY 1986 Base	FY 1986 New	FY 1987 Base	FY 1987 New	10-237 Increase No. and Date	10-238 Pkg. No. and Date	Park Priority
10	RM-4	Balconies Cave Trail Improvements	8		8		8		8		8				
11	RM-5	Bear Gulch Cave Trail Improvements	8		8		8		8		8				
12	RM-8	North Wilderness Trail			10		10								
13	RM-16	South Wilderness Trail			10		10								
14	RM-17	Air Quality Monitoring						10		10		10	15(FY85)		16
15	RM-20	Climbers Impact	3		3		3	6	3	6	3	6	14(FY85)		12
16	WR-1	Water Resources Management Plan						8		8		8		803( )	
17	RM-18	Mistletoe Monitoring			1		1		1		1		44(FY85)		
18	RM-15	Dodder Control	1		1		1		1		1		44(FY85)		
19	C-2	Archeologic Site Protection				5								309( )	

PINNACLES NATIONAL MONUMENT
February 1983

FUNDS IN THOUSANDS

N/CRMP Priority	Project Number	Project Title	FY 1983 Base	FY 1983 New	FY 1984 Base	FY 1984 New	FY 1985 Base	FY 1985 New	FY 1986 Base	FY 1986 New	FY 1987 Base	FY 1987 New	10-237 Increase No. and Date	10-238 Pkg. No. and Date	Park Priority
20	N-5	Endangered Species	1		1		5								
21	N-4	Mammal Inventory	1		1		5								
22	N-3	Limnological Inventory	1		1		1								
23	N-2	Entomological Inventory	1		1		1								
24	RM-13	Beechy Ground Squirrel Control	1		1		1		1		1		44( )		
25	C-3	Artifact Preservation			3		4		1		1				
26	RM-21	Oak Reproduction Monitoring	1		1		1		1		1			802( )	
27	N-9	Fire Ecology Monitoring	5		5		5		5		5				

II. DESCRIPTION OF THE ENVIRONMENT

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A. Geography

Pinnacles National Monument is located in central California in Monterey and San Benito Counties, about 140 miles south of San Francisco and 200 miles north of Los Angeles (Figure 1). It is 35 miles south of Hollister, and can be reached on the east side by California State Route 25 and on the west side by U.S. Highway 101.

Most of the monument is covered by coast range chaparral. Pinnacles is one of only two National Park Service areas containing a complete representation of this type chaparral. Relief is variable with elevations ranging from 760 feet in the southeast quandrant of the monument to 3,305 feet on North Chalone Peak, a difference of 2,545 feet in 2.4 miles (Figure 2).

All monument drainage flows into Chalone Creek which, in turn, flows southward along the eastern boundary and then westward below the southern boundary into the Salinas River. One major drainage, Bear Gulch, is impounded at its upper end by a man-made dam which forms Bear Gulch Reservoir. Streams flow during the spring and very early summer months. Ground water exists in the alluvial material of the major drainages year-round. The well that serves the Headquarters area taps saturated alluvium in Chalone Creek.

B. Nearby Population

Nearly six million people live within a 100-mile radius of the monument and about 20 million within a 200-mile radius. About 95 percent of that total is urban.

A large number of the residents of San Benito and Monterey Counties are Hispanic. The descendants of the original Spanish settlers and more recent immigrants from Mexico lend a Latin aura to the area.

C. Visitation

Pinnacle's visitation has increased threefold in the past 25 years, from 68,000 in 1958 to 171,000 in 1982. Use levels commonly exceed capacity on weekends and holidays during the spring and fall. Visitation is expected to continue to increase.

Fig. 1

ACCESS

MAJOR TOURIST ROUTES

114	20,003-A
DSC	AUG. 75

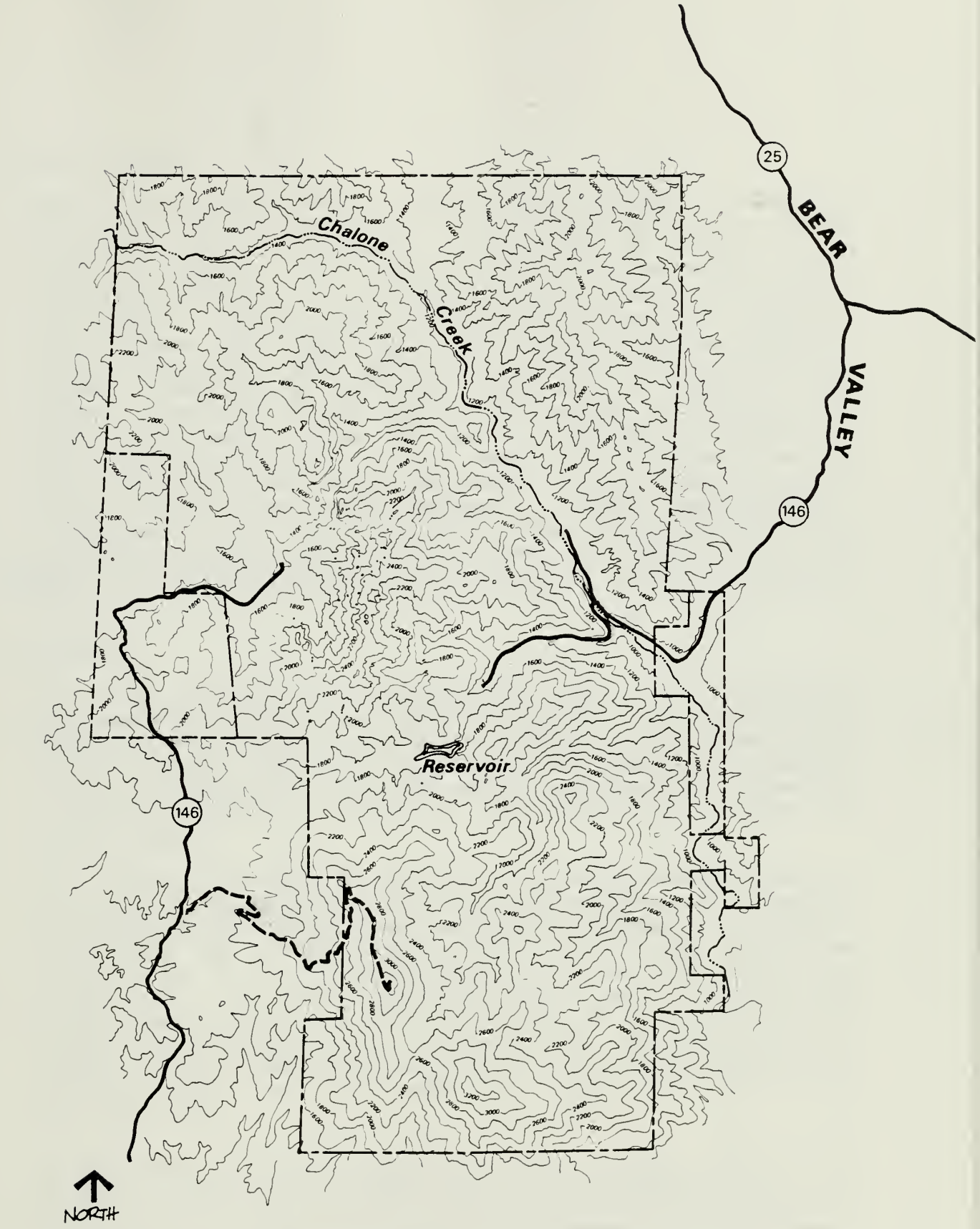

Fig. 2
TOPOGRAPHY
CONTOUR INTERVAL - 200 FEET

114	80,008
WRO-PD	AUG. 75

D. Local Economy

Most of the adjacent land is owned by local ranchers or managed by the Bureau of Land Management. The primary activity is cattle ranching. Most of the public land bordering the monument is in grazing allotments. It is unavailable for public use because access is through private land. San Benito County's economy is primarily agricultural. However, small, high technology firms have located in the Hollister area. Light industrial and high technology companies employ about 2,500 workers, mostly in the Hollister/San Juan Bautista areas. A majority of the county's population is centered in the northern one-fourth of the county. The remainder of the county is made up of ranches, farms and small, unincorporated communities. Tres Pinos and Paicines, two such communities, are located on the main north/south route through the county and are directly impacted by the traffic to and from the monument. Pinnacles Campground, Inc. is adjacent to the east boundary on Highway 146. There are two additional private campgrounds in Paicines. Visitor traffic to the west side of the Pinnacles brings business to Soledad, in Monterey County.

E. Geology

The unique geology of the Pinnacles was the reason for its protection and eventual designation as a National Monument. The rock was formed during an extended period of volcanic activity. Basalt, rhyolite and other flows were forced to the surface through fissures in a basement of quartz diorite. The Pinnacles are the remains of these flows and of late pyroclastics. Erosion has acted on the rock to create its present shapes.

The Chalone Creek Fault runs parallel to the major drainage along the east side of the monument. It is the contact between the Pinnacles formation and the temblor formation which is composed of more recent sedimentary rock. Block faulting is believed to have raised the eastern edge of the Pinnacles' formation adjacent to the Chalone Creek Fault. Two primary drainage channels have cut water gaps through these rocks, one at the upper end of Bear Gulch and one between Machette Ridge and the Balconies cliffs. The gaps were later roofed over when large rocks spalled off the adjacent cliffs, slid down the slopes, and became wedged in the tops of the gaps to form the talus caves.

Earth movement along the San Andreas Fault zone has displaced the Pinnacles rocks about 195 miles north of their theoretical point of origin, which is believed to lie near Highway 138 between Lancaster and Gorman, California. The right lateral movement of displacement is still occurring at a rate averaging four centimeters a year.

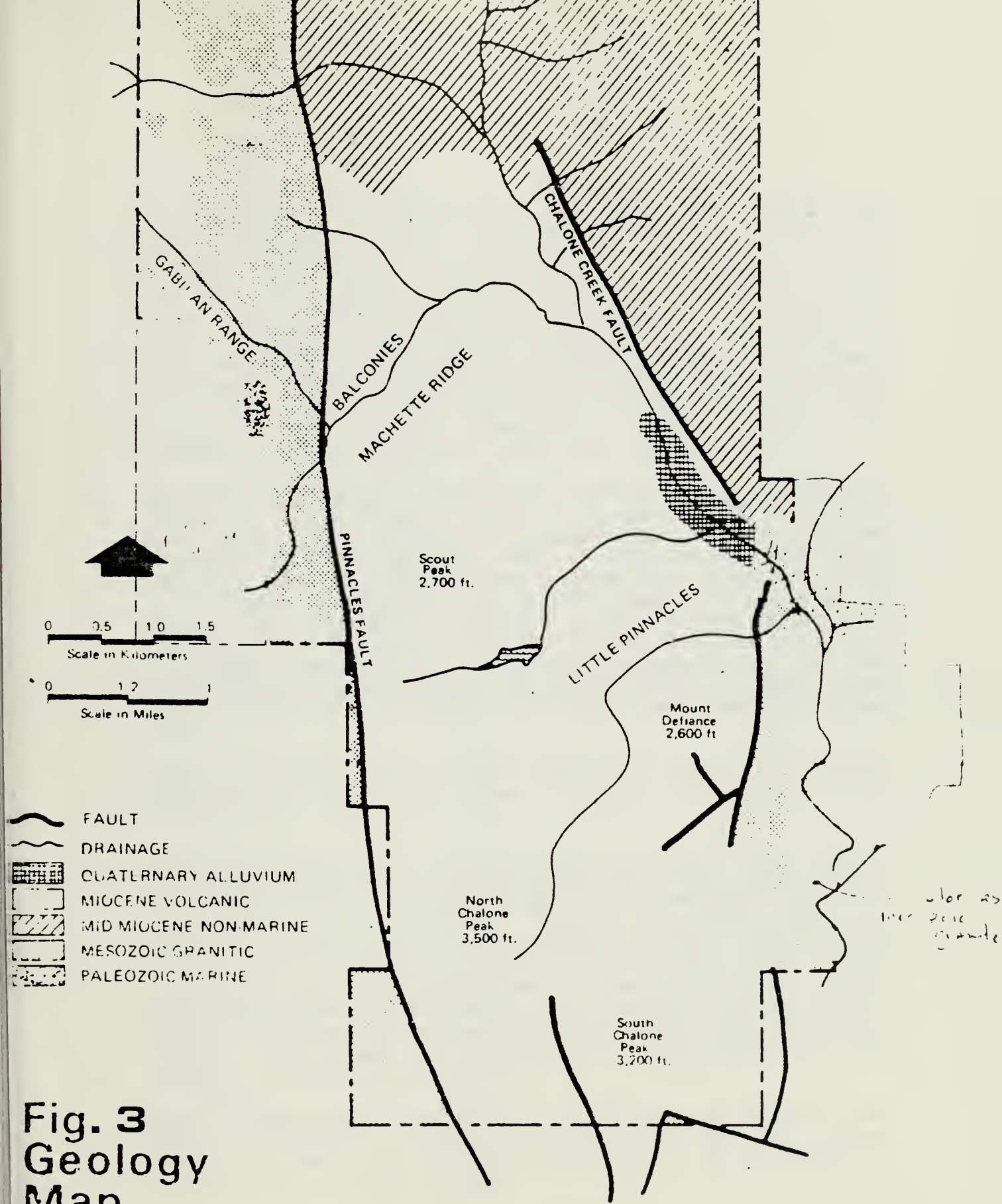

Fig. 3 Geology Map

F. Soils

Pinnacles' soils are typically thin, undeveloped sandy loams or loamy sands with large amounts of gravel and little ability to retain nutrients and water (Figure 4). Nutrient supply is low but well balanced. Small areas of soil are quite rich in humus but average only two feet in depth. The soils offer little resistance to root growth, thus allowing extensive root development. These properties tend to increase moisture loss from the soil, causing less water to be available for the plant cover. When the plant cover is disturbed, soils become acutely susceptible to erosion during periods of intense rainfall. Off-trail travel and grazing, plus the activities of feral pigs pose threats to soil stability in selected areas of the monument. A brief description of major soil types follows.

Laniger series soils are derived from a coarse, poorly consolidated sandstone. All of these lie east of and parallel to the Chalone Creek Fault. They are not of the same origin, or from the same geographic location, as soils west of the Chalone Creek Fault separating them. The surface layer in these soils ranges from eight to 22 inches in thickness, is grayish brown, and described as gravelly loam in texture. The subsoil is 12 to 26 inches thick, pale brown, and gravelly, coarse sand loam. The series is low in fertility, its water capacity is 1.5 to 4 inches, permeability is rapid and runoff is rapid to very rapid. Topographic characteristics in the area of these soils are badland type erosion and large semicircular slumps.

Igneous rock land soils are quite shallow and excessively drained. They occur near the rocky spines of igneous rock outcrops along ridgetops.

Sheridan series soils are well drained to excessively well drained loamy soils underlain by weathered granite and other igneous rocks. The oakgrass savannah occupies a large part of these where more humus has accumulated than elsewhere. Average thickness is 18 to 24 inches, water holding capacity is two to four inches, runoff is rapid to very rapid, and the erosion hazard is very severe. The Laniger and Sheridan soils are characterized as potentially erosive, a major problem that makes them unsuitable for cultivation. Since grazing is not permitted, the only recommended use is for woodland and wildlife preserve. Maintenance of a close-growing plant cover and plant residues is recommended at all times.

Sandy alluvial land occurs mainly in the bottom of Chalone Creek where it is covered with riparian vegetation. The deep, coarse textured soil has a water holding capacity of four to six inches and its reaction is slightly alkaline.

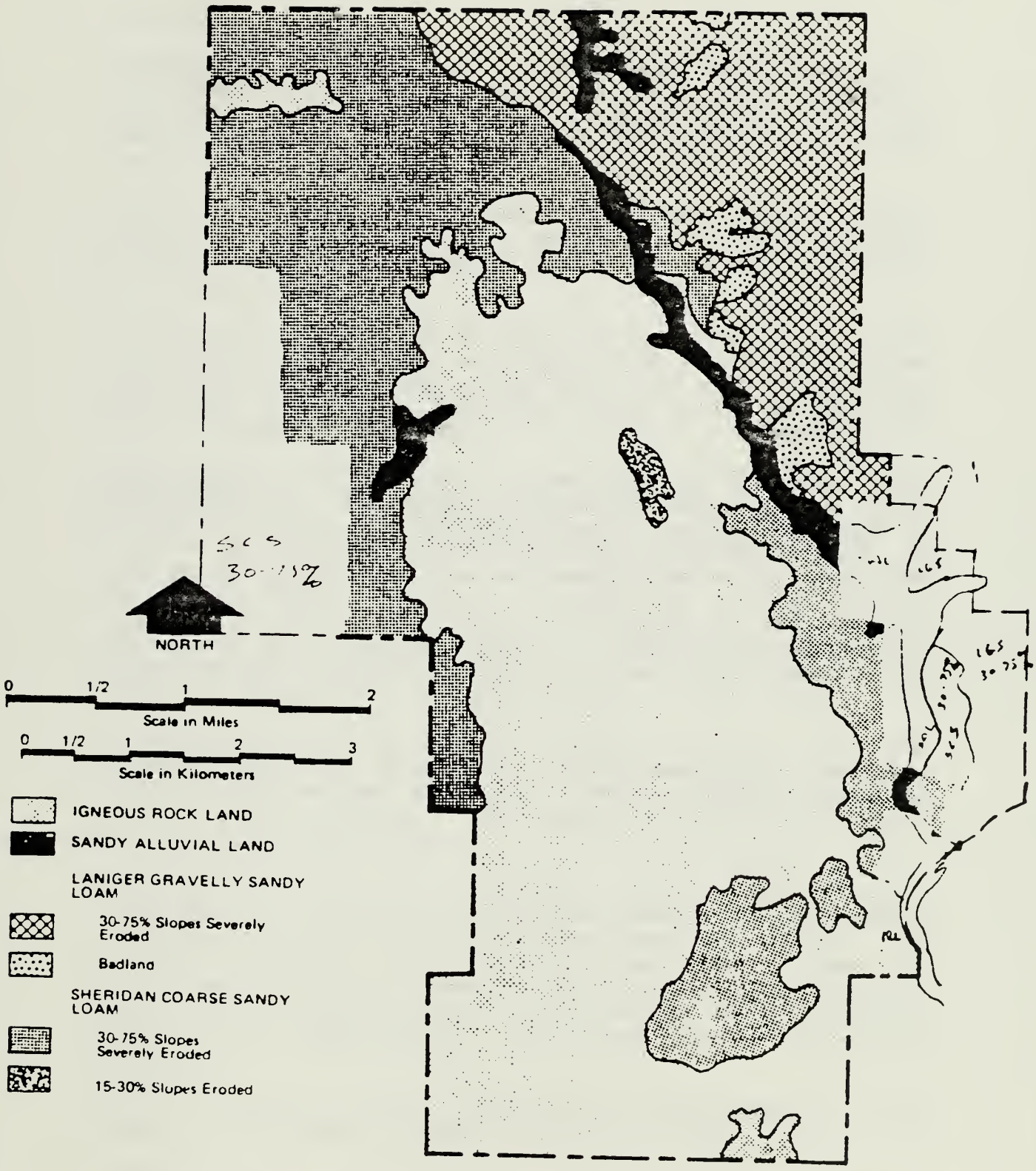

Fig 4. Soil Types

G. Hydrology

Surface water runoff drains out of the monument via Chalone Creek. The headwaters and several tributaries of Chalone Creek originate a short distance outside the monument. There is a dam in the stream flowing through Bear Gulch. The water in the reservoir is not being used for domestic purposes.

There are at least nine springs known within the monument. Several of them have been used as a water supply, but now are for emergency use only. Generally, the springs occur either at fault contacts or at lithologic contacts.

The present water suppy for the east side of the monument is a well 35 feet deep. It is located near Chalone Creek, opposite the Chalone Creek Picnic Area. The water supply for the west side is an artesian well (depth of 355 feet) that flows freely at the surface under static (nonpumping) conditions.

Ground water is influenced by the geology of the monument. Three geohydrologic units are present: 1) granitic and metamorphic rocks, 2) volcanic rocks, and 3) sedimentary rocks. Most of the monument is underlain by volcanics. The western and southeastern sides are underlain by granites and the northeastern corner by sedimentary rocks. The actual location of ground water in the granitic, metamorphic, and volcanic rocks is determined by the geologic structure of the rocks and fractures in them caused by faulting. Three northward trending faults that traverse the monument have produced a structural trap for ground water.

Good water quality in the monument is important to park visitors and to those animals that inhabit the riparian communities. Negligent visitors litter and empty human waste into the reservoir above the caves and into the streams. This endangers fish, aquatic insects, and other life in the streams.

High bacterial counts (735 to 16,000 ppm of *E. coli* equivalents) and large amounts of nutrients encourage the growth of algae in summer and create a potential breeding ground for infectious diseases. This may have contributed to the large dieoff of deer, racoons, foxes, and other animals late in the summer of 1972. Dead animals examined by the U.S. Public Health Service revealed that they were infected by a bacterium of the genus *Arizona*, a type closely related to the genus *Salmonella*.

There is no flow in or out of the Bear Gulch Reservoir during the dry season, it is stagnant and subject to eutrophication.

H. Climate

The monument has a Mediterranean climate characterized by wet winters and dry summers. Precipitation usually begins near October, increases

in amount and frequency through March and tapers off until it stops completely in May or June (Figure 6). Rain is rare from June to September. Snow occurs in small amounts almost every year between mid-December and January. On rare occasions it may cover the entire monument to a depth of 6 to 12 inches. Average annual precipitation is approximately 16.5 inches with recorded extremes from 7 to 35 inches. Temperatures range from as low as 10°F in December and January to near 120° in August and September (Figure 5). Though summers are normally quite hot, low temperatures usually drop into the high 40s and low 50s with day/night ranges as large as 70°F. Winter day/night temperatures usually vary no more than 25°F and are usually mild with few days below freezing. Thunderstorms occur once every few years.

I. Vegetation

Chaparral, riparian, foothill woodland, grassland and xeric, rockland communities are found at Pinnacles. The most current vegetative map was completed in 1936. Vegetative sampling, scientific definition of communities and new mapping are needed to accurately describe present communities. The chaparral communities cover approximately 80% of the monument. Foothill woodland, grasslands, riparian areas and xeric, rockland communities make up the remaining 20%.

Chaparral

Chaparral is a mixture of shrubs adapted to the extremes of temperature and precipitation which characterize Mediterranean climates and to periodic consumption by fire.

Chaparral shrubs begin growth in January or February, they flower in spring and set seed by mid-summer. They are dormant during the hottest, driest part of the year. The structure, chemical composition and low moisture content of mature chaparral encourage its complete combustion in fires during the summer or fall. Chaparral plants are rejuvenated by intense fire, either resprouting from below ground structures or producing numerous seedlings from seed that lies dormant in the soil until scarified by fire.

Pinnacles chaparral is a mosaic of shrub communities. Community distribution depends on aspect, slope and soil characteristics. Either chamise or a mixture of sage species occur on south slopes. The more moderate north slopes support a rich mixture of buckbrush, manzanita, hollyleaf cherry and other shrubs.

Present fire regimes differ from those natural in chaparral. Man has influenced chaparral fire regimes, changing the timing, frequency and location of ignitions. Suppression of fires delays the rejuvenation of fire adapted or dependent shrubs and forbs. Both density and the percent of dead material increase with time elapsed since the last fire. This contributes to greater intensity and size when fires do occur.

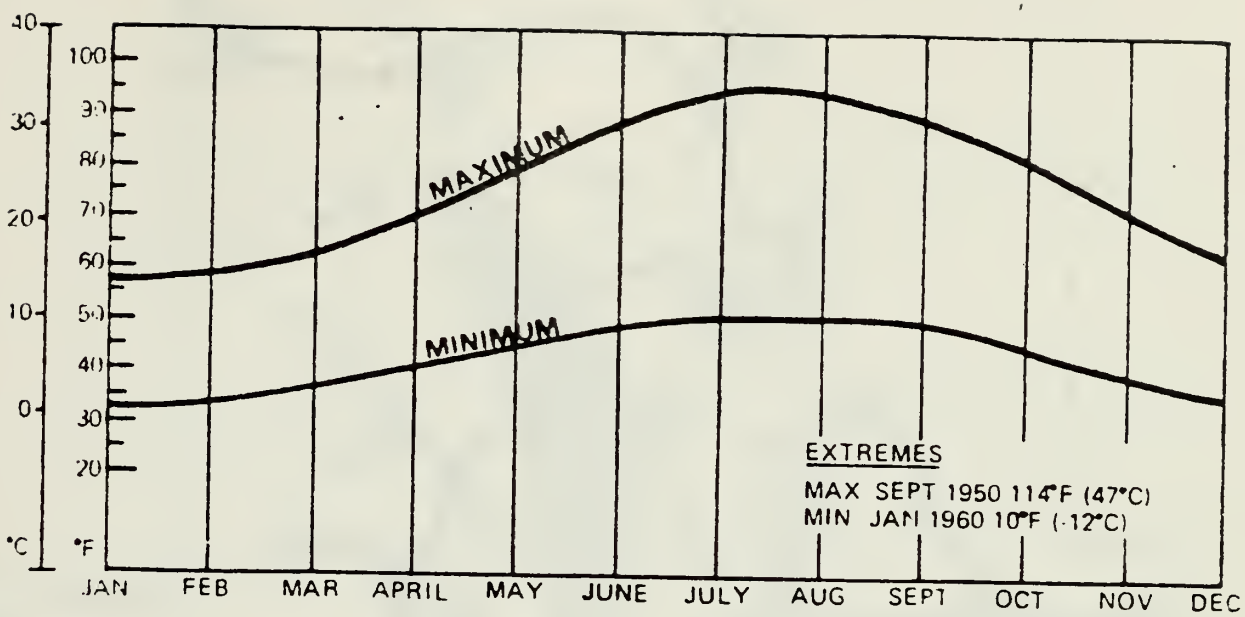

FIGURE 5. AVERAGE MAXIMUM & MINIMUM TEMPERATURES FROM 1956 - 1972

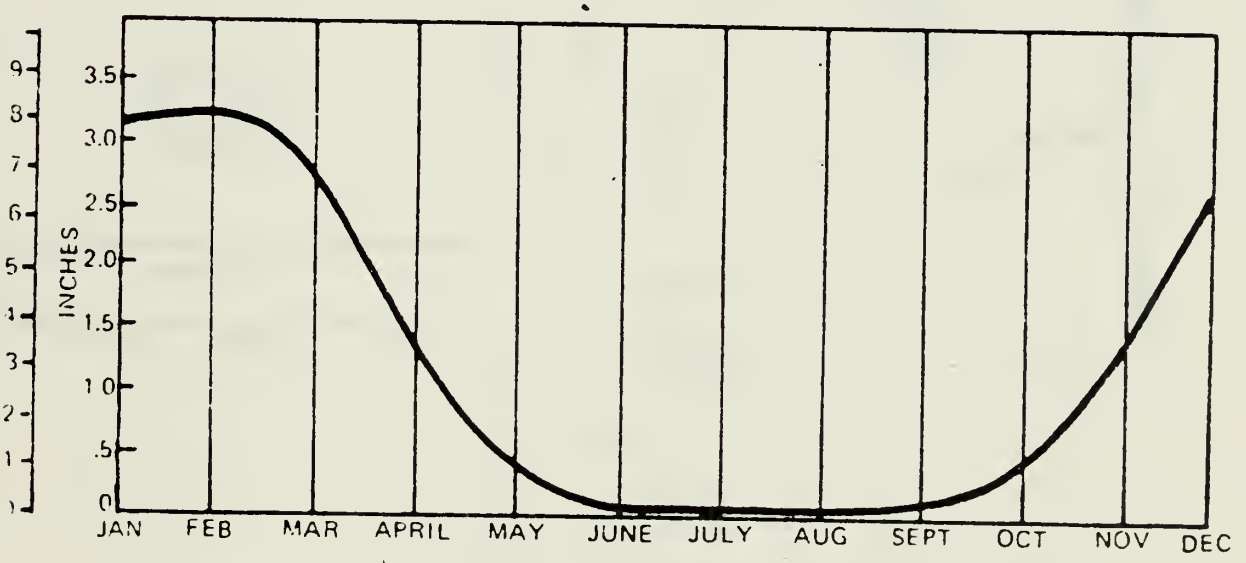

FIGURE 6. AVERAGE RAINFALL FROM 1962 1973

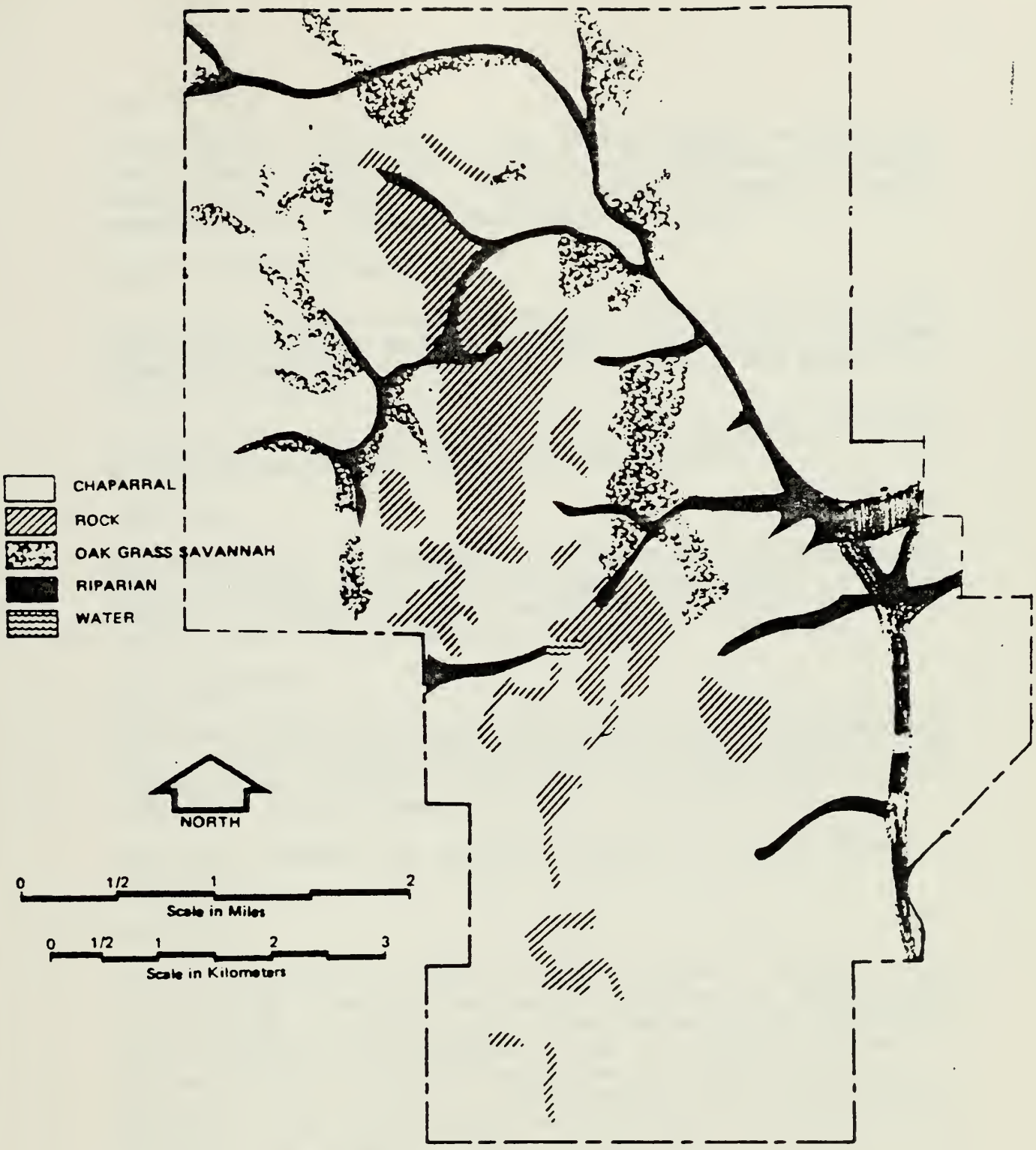

Fig 7. Vegetative Cover

Riparian Areas

Species found in the riparian areas of the monument include digger pine, sycamore, willow, coast live oak, blue elderberry, California buckeye, and cottonwood. Although limited in acreage, riparian communities are of trememdous importance to wildlife.

Foothill Woodland Communities

The foothill woodland communities occupy areas of gentle relief, most often on the north and east facing slopes. Typical foothill woodland communities consist of blue oaks and digger pines with a ground cover of herbs and grasses.

An example of valley oak woodland is found on the bench of alluvium at the confluence of Bear Valley and Chalone Creeks.

Grasslands

Annual grasslands are composed of introduced Mediterranean grasses, chiefly wild oats, annual fescue and annual brome grasses. Perennial grasses are present in small amounts in the annual grasslands. Species include purple needlegrass, oniongrass, and ryegrass.

Xeric Communities

The xeric, or bare rock communities are composed of plants adapted to thin, coarse soils and dry conditions. Dominant plants include lichens, mosses, flowering annuals, and a few woody plants from the chaparral or woodland communities which find pockets of soil.

There are currently 31 identified species of exotic plants at Pinnacles.

J. Wildlife

Wildlife is relatively abundant within the monument. Little is known of the ecology of most species, except those that are easily trapped or of interest to sportsmen. Due to the limited area of the monument and the different land management values of neighboring ranches, it has been difficult to sustain populations of large predators such as the mountain lion and coyote. More importantly, fire suppression has radically altered the structure and variability of wildlife habitat throughout the monument. This has resulted in changes in the distribution and population levels of native wildlife species and communities.

Fish are rare in Pinnacles. The three-spined stickleback, a recently confirmed resident, is a native inhabitant of the monument waters. It is a carnivorous fish that feeds predominantly on aquatic insect life. These fish inhabit Bear Gulch and the north fork of Chalone Creek. Minor populations of green-ear sunfish exist in isolated

pools along Chalone Creek. Tadpoles, catfish and aquatic insets inhabit Bear Gulch Reservoir.

Mammals of Pinnacles include black-tailed deer, bobcats, grey fox, coyotes, raccoons, bats, badgers, rabbits, elephant-eared kangaroo rats, and other small rodents. Occasional sightings of the mountain lion have been recorded in the monument.

Amphibians and reptiles known to inhabit the monument include the Pacific pond turtle, southwest pond turtle and several species of reptiles. The Pacific pond turtle once inhabited the majority of sluggish streams on the Pacific slope. It shares a common habitat with the three-spined stickleback. Their population and distribution has greatly decreased due to habitat disturbance by stream channelization, predation by man, and increased concentration of water pollutants.

Intense use of riparian areas has tended to denude vegetation, thus destroying various habitats essential to snails, turtles and other animals requiring moist and/or dark habitats for part of their life cycle.

Invertebrates are common but need to be inventoried. Occasional fresh tests of a species of terrestrial snail have been found in various locations. Mantidflies and wingless grasshoppers have been sighted on rare occasions within the monument. A fairly large insect collection has been made of specimens from the area surrounding Pinnacles.

Endangered species with historical or present distribution in Pinnacles are the California condor (Gymnogyps californianus) and the American peregrine falcon (Falco preprinus anatum). There may be other endangered species of fish, mammals and amphibians present in the monument, but more research is needed to substantiate identification and observations.

It is believed that the California condor was a common nesting species in Pinnacles until 1900. Unsubstantiated observations of the condor are made every few years.

The American peregrine falcon found suitable nesting habitat at Pinnacles. Observations of activity were recorded until 1968.

Pestilent population densities of Beechy ground squirrel (Citellus beecheyi) are present within portions of Pinnacles National Monument. The squirrel and its burrows are frequently observed in areas of concentrated visitor use. Its natural food supply has been supplemented by food supplied by park visitors. The abundance of available food has allowed a marked increase in their population density. Natural predators in, or adjacent to, population concentration areas of these rodents such as snakes, hawks, and badgers are too few to adequately suppress this abnormal population.

Both the range and the number of feral hogs, Sus scrofa, have expanded in recent years. Sightings of animals and the evidence of their activities have increased. Changes in hunting patterns around the monument and acquisition of lands by the NPS may have contributed to the increases. However, neither the number of hogs, their range, their habits, their effect on native species nor the reasons for their expansion have been investigated at Pinnacles. The long term effects, positive or negative, of rooting on vegetation and of competition on native wildlife are unknown.

K. Archeology and History

Pinnacles National Monument has been nominated to the National Register of Historic Places as a non-contiguous archeological district. Twenty-six historic or prehistoric sites have been located and it is a near certainty that additional cultural resources will be located within the monument in the coming years (Haversat, Breschini, 1981). Four of the sites located are the remains of historical homesteads. In addition, ten of the monument's buildings are listed as classified structures on the National Register of Historic Places. All of these structures were either constructed or modified by the Civilian Conservation Corps during the 1930's.

Ethnographically, the Coastanoans that occupied this area seem to have been a hunting and gathering group much like other natives of California. Their diet consisted of acorns and other plant food in season, while small game, deer and fish provided meat. Vegetable foods were processed in bedrock morters and portable morters with cobble pestles. Occasionally, the mano and metate were also used. Stone tools, along with lithic scatter and fire altered rock, are the most enduring artifacts left by these people. The baskets and nets that were used in the gathering, processing, and storing of food have not survived.

Permanent villages were probably made of large domed houses covered with reeds and grasses, circular brush enclosures used for dances and ceremonies, and small conical sweat houses. Cemeteries were nearby, but not in the villages. Large shell mounds and trash middens were usually associated with permanent villages. Very little is known about the makeup of seasonal hunting and gathering camps. They seem to have been transient in nature with makeshift shelters and bedrock morters where outcrops of suitable stone permitted. Lithic scatter will almost always occur, but a midden may or may not be visible at these sites.

History

Initial European impact on the Pinnacles country, although not documented, must have occurred shortly after the founding of the Soledad Mission late in the eighteenth century. Cattle ranching operations from the mission and ranchos in the Salinas Valley could have utilized acreage now part of the monument.

The coming of homesteaders in the 1880's resulted in the first permanent European residence in the Pinnacles. The oldest recorded homestead was that of Harrison Lyons, patented in 1892, but occupied from about 1886. The last homestead in the Pinnacles was abandoned around 1930.

During World War I, the nation's need for strategic minerals sparked a short lived interest in mining, principally for copper, in Pinnacles. Several prospects near the present Chaparral Ranger Station were patented. However, total production was minimal and the "mines" were abandoned in the late 20's and early 30's.

Today, little physical evidence of European man's pre-monument influence on Pinnacles remains, save a few stone foundations, various broken down implements, a few prospect sites, and several miles of barbed wire drift fences.

III. NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAMS

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A. Natural Resources Management Program

1. Overview and Needs

Management actions are proposed to protect the natural resources. The actions are in the area of fire, erosion control along trails and climbing routes, fencing, vegetation, wildlife, and air quality.

Fire

Almost the entire area around the perimeter of Pinnacles has burned in prescribed or wildfires during the last fifty years. Some of these fires burned portions of the Pinnacles but the core of the area has not burned since before the establishment of the monument. The chaparral communities are uniformly mature over much of the monument. The vegetation is dense, continuous and contains a high percentage of dead material. Uniformly mature chaparral is highly flammable and burns intensely. Wildfire in chaparral of this age is difficult to control and presents a potential hazard to park structures, visitors and employees.

Natural ignitions are rare in the Pinnacles. Fire frequency data developed by Greenlee (1981) extends only into the mid 1800's and reflects man-caused ignitions by ranchers and settlers. Using present methods for determining fire history, we can only speculate on the frequency, timing and intensity of fires that burned prior to settlement of the area by Europeans. It is likely that those fires which reached Pinnacles covered vast acreage and started in areas with a higher lightning frequency. Such natural fire is now impossible because of fire suppression policy and land ownership patterns in surrounding areas. A program of prescribed fire by planned ignition is necessary to reduce hazard fuels and to restore a natural process that shapes vegetation patterns in the monument.

To meet that need, a preliminary prescribed burn program was developed for the monument in 1976 by Biswell and a fire history map was completed by Greenlee in 1981. Both have been used in development of a draft fire management plan for the monument. Between 1977 and 1982, 1,656 acres were prescribed burned, far below a target of 1,000 per year. Prescriptions have been prepared for all aspects but the north slopes. Excellent weather and fire behavior records are being generated and should result in more specific prescriptions.

Monument personnel propose analysis of past burns to determine the range of prescriptions that best duplicate the result of

natural fire, allowing reproduction by all chaparral species and discouraging invasion by exotics.

Recognizing that a fire suppression program must also be continued, a written fire protection agreement with the California Department of Forestry (CDF) is in effect, updated annually, and has been incorporated into the monument's fire management plan. A mutual aid zone with CDF has been enlarged and monument personnel and equipment respond to several fire suppression requests each year.

An expansion of this program is identified in the following project statements. The monument will continue with the above-mentioned projects while seeking to develop fire protection agreements with the Bureau of Land Management and the U.S. Forest Service (RM-1). These agreements will benefit both the monument's prescribed burn program and fire suppression program. Without such agreements, interagency fire suppression and related fiscal responsibilities will not be well-defined.

The monument will also work with CDF and monument neighbors to allow selected ignitions not started under the prescribed burn program to continue, to complete the monument's fire management plan, and to conduct a prescribed burn program that averages about 1,000 acres per year. Such actions will enable the monument to effectively reintroduce fire into the ecosystem.

Any burning within the monument will destroy plants, and animals that are unable to escape, and, temporarily, some wildlife habitat and food. The effect of plants and animals will be monitored. During the burning, smoke will be annoying to monument visitors.

Following prescribed burns, the areas will be distracting until regrowth occurs. Fire control procedures will be followed at all times and the local Air Quality Control Board will be consulted to coordinate the fires.

Trails

There are approximately 26 miles of maintained trails in the monument. Since these trails represent the only access to most of the geological and ecological features for which the monument was established, one or more of them are used by nearly every monument visitor.

Trails throughout the park are severely deteriorated due to shortcutting and heavy rainfall. Some have reached the point of being dangerous to the visitor and damaging to the natural area. Visitors are hiking crosscountry in areas where there are now no trails. This is damaging the plant life, causing trails that are used, but not maintained or patrolled. The two cave trails

are inadequately marked, which causes off-trail use that is harmful to both the land and the visitor.

The North and South Wilderness Trails are each about 70 percent complete; about 2 miles of additional trail are needed to complete the North Wilderness Trail and about 3 miles to complete the South Wilderness Trail. The Frog Canyon Trail and the Frog Canyon-Chalone Peak Trail projects (RM-6 and RM-7) are no longer being considered for implementation, due to rugged terrain and a decision to complete the South Wilderness Trail. Although some trail rehabilitation and stabilization was completed on the High Peaks Trail as a result of funding under RM-9, serious trail-related problems, as noted above, still need to be corrected.

To correct these deficiencies, it is proposed to (a) construct retaining walls at serious shortcut and erosional sites (RM-19), (b) provide handrails and enlarge steps where necessary (RM-4), (c) obliterate shortcuts by signs and brush and by planting native shrubs (RM-19), (d) eliminate confusing painted arrows in the Bear Gulch Caves (RM-5); (e) improve the Bear Gulch Caves Trail surfaces (RM-5); (f) construct a trail from South Chalone Peak to Chalone Creek through the southeast corner of the monument (RM-16); and (g) construct a trail from the southeast corner of Section 20, R7E, T16S, to the existing trail extending northward from the Chaparral Campground (RM-8).

Retaining walls, improved steps, and other features resulting from trail rehabilitation will be made to blend in with the environment by native plantings, choice of materials, natural weathering and accumulations of lichens and mosses. New trail segments will be carefully placed to minimize soil compaction and erosion. Through effective design, retaining walls will eliminate the gravel that now accumulates on the trails below established shortcuts. Level trails with firm edges and handrails will offer increased safety for hikers and reduce the tendency to hike off the trail, reducing erosion and damage to vegetation.

Rehabilitation of trails adjoining known archeological sites, if necessary, will not involve removal of cultural materials but will include preservation actions such as installation of pads of culturally sterile earth to decrease foot traffic compaction. Relocation and construction of new trails will be preceded by archeological field investigations and compliance with Executive Order 11593 obtained. Completion of the North and South Wilderness Trails would eliminate two existing dead-end trails and improve access to the wilderness area for both visitors and monument personnel.

Negative impacts of the trail work will include temporary inconveniences to visitors during construction; the destruction

of some plants and a temporary disruption to wildlife due to construction; and an increase in visitor-associated impacts (e.g., soil compaction, erosion, possible damage to archeologic and historic sites and man-caused fires).

Fencing

The boundary of Pinnacles National Monument is 26 miles in length and abuts private, State, and Bureau of Land Management administered lands. Although the entire boundary has been surveyed (RM-10), only 6.25 miles have been fenced. Cattle enter the monument from adjoining rangeland. Up to 450 head of cattle have been found at one time on 25 percent of the monument in recent years. Cattle cause erosion, are vectors for the spread of exotic plants and detract from the natural setting.

The feral pig population has increased steadily over the past 10 years. A means of reducing movement across the boundary would be to design a fence that would exclude pigs as well as cattle.

The lack of a fence circling the monument also results in the sport hunting and poaching of monument wildlife. Adjacent lands, both public and private, are popular hunting areas for deer and pigs. Without a fence and with the probable increase in game that is likely to occur when areas are burned in accordance with the monument's fire management plan, such trespass can be expected to increase.

To eliminate cattle trespass, to prevent the movement of feral pigs into the monument and to reduce hunter trespass and poaching, the monument will completely fence the boundaries (RM-11). Since the boundary follows, for the most part, political lines rather than natural features, the monument will work with the Bureau of Land Management to develop and implement a cooperative land management agreement (RM-14). Such an agreement would enable both agencies to construct fence segments that could effectively reduce cattle trespass and produce compatible wilderness, watershed, and fire management programs. On the negative side, installation of the fencing will cause some plant destruction and limited noise and visual impacts. Native wildlife movement should not be hindered. Additional funding will be required to maintain the fence and to remove the feral hogs, if indicated.

Vegetation

Two parasitic plants, dodder and dwarf mistletoe, have only recently been recognized as threats to native park flora. Dodder (Cusanta brachycalyx) is rapidly spreading throughout the more heavily used corridors of the park. Its host, California buckwheat is eventually killed as a result of this relationship.

A rare subspecies of buckwheat may exist here that could be endangered by the dodder.

Experimental burning of dodder infested buckwheat is proposed. Burning will kill both parasite and host plants. Buckwheat will reinvade from surrounding unburned areas as natural succession proceeds.

Mistletoe (Arceuthobium cumpylopodum, has become established in a dense plantation of digger pines in the headquarters area and in nearby native trees. The sticky mistletoe seeds are forcefully ejected from the plant and must hit another branch or an adjacent digger pine to take root. Infestation of native digger pines has occurred where they are close enough to the plantation to allow dispersal. Rapid spread from the infection site is unlikely because of the low density and discontinuous distribution of digger pine in the monument. Monitoring will continue under RM-18.

Wildlife

Beechy ground squirrels (Citellus beecheyi) are native to the monument and comprise an important link in the complex chain of ecological interrelationships. However, the Beechy ground squirrel population is abnormally high in the monument, especially in the campground and picnic areas. This unnatural population level is considered to be a reflection of the unnatural food supply from park campers and picnickers. High densities of this rodent could result in sylvatic and bubonic plague. Their burrowing activity and related soil erosion adversely affects road shoulders, trails, campsites, and picnic areas.

To control squirrel population levels within the monument, a control program that utilizes gas cartridges of sulfur and zinc phosphide has been implemented (RM-13). This program, coupled with a monitoring effort, will be continued. Safeguards will be provided to wildlife and the environment in accordance with Executive Orders 11643 and 11870. These orders will preclude the chance that birds of prey and other wildlife will be affected.

Air Quality

The entire region, including Pinnacles, is subjected to seasonally large quantities of aerial pollutants, including that from prescribed burning and wildfires, automobiles, and light industry in the Santa Clara Valley. Under the Clean Air Act, the Service has a responsibility to protect visibility and other air quality related values. Although over 90 percent of the monument is designated a Class I air quality area under the

Clean Air Act Amendments of 1977, no program currently exists at the monument to measure particulates or gaseous pollutants. The monument has no data, other than visual assessments by monument personnel, on which to base air resource management decisions.

It is proposed that two air quality monitoring stations be established within the monument, one at Headquarters and one at the Chaparral Ranger Station. Once installed, air quality will be closely monitored in order to establish air quality trends and to provide a basis for future control programs.

2. Natural Resources Management Project Statements

Following is a summary list, including current status, of the major natural resources management projects for Pinnacles National Monument. Detailed project statements for each can be found on the pages to follow.

Project No.	Project Title	Status	Date Final Proposed
RM-1	Fire Protection Agreements	in-progress	1974
RM-2	Prescribed Burn Program	in-progress	1974
RM-3	Firebreak Revegetation	eliminated	1974
RM-4	Balconies Cave Trail Improvement	in-progress	1974
RM-5	Bear Gulch Trail Improvement	in-progress	1974
RM-6	Frog Canyon Trail Construction	eliminated	1974
RM-7	Frog Canyon-Chalone Peak Connection	eliminated	1974
RM-8	North Area Wilderness Trail	in-progress	1974
RM-9	Trail Stabilization and Maintenance	completed	1974
RM-10	Boundary Survey	completed	1974
RM-11	Boundary Fencing	in-progress	1974
RM-12	Bear Gulch Dam Repair	completed	1974
RM-13	Beechy Ground Squirrel Control	in-progress	1974
RM-14	Wilderness Management with BLM	proposed	1981
RM-15	Dodder Control	proposed	1981
RM-16	South Wilderness Trail	in-progress	1981
RM-17	Air Quality Monitoring Program	proposed	1981
RM-18	Mistletoe Monitoring	in-progress	1981
RM-19	Trail Stabilization and Rehabilitation	proposed	1981
RM-20	Impact of Climbers on Resources	proposed	1983
RM-21	Oak Reproduction Monitoring	proposed	1983

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-1-FIRE PROTECTION AGREEMENTS.

2. Statement of Problem or Issue: One natural fire started in Pinnacles during the last 50 years. All other fires were man-caused and most originated outside the monument on BLM or private land. It is imperative that the fire suppression and related fiscal responsibilities of each agency be clearly defined so that response is efficient and effective. In addition, agencies should understand the fire suppression methods that are appropriate and in keeping with the resources management policies of the other agencies.

   Current Actions and Results: State legislation permits fire protection agreements among Government agencies and private landowners. Based on that legislation and a statewide master agreement, a written fire protection agreement with the California Department of Forestry is in effect, updated annually, and has been incorporated into the monument's fire management plan. The NPS has also negotiated agreements with BLM and the USFS. Under the ICS system, NPS crews and equipment may be requested for fire on lands administered by BLM and the USFS or protected by CDF.

   The mutual aid zone with CDF has been enlarged, monument personnel and equipment respond to several mutual aid requests each year from CDF, and CDF units have been invited to participate in NPS prescribed burns. Cooperative burns with BLM and CDF were carried out in 1983.

3. Alternative Actions and Likely Impacts:

   A. No action - Mutual fire suppression efforts with CDF and BLM will be delayed, and fire-related training programs for NPS, CDF, BLM and USFS will be duplicated. Confusion, delay and resource damage (use of permanent dye retardent, heavy equipment, highly visible firelines, etc.) could result from lack of familiarity with NPS resources management policy.

   B. Develop and maintain interagency fire protection agreements - The monument will review and update the CDF agreement annually and develop mutual aid agreements with BLM and USFS. The BLM agreement based on ICS will clearly define areas of responsibility in the event a fire crosses a NPS-BLM boundary. BLM does not maintain significant suppression forces locally and has contracted fire suppression to CDF. The USFS agreement will define procedures for requesting NPS equipment and personnel, fiscal responsibilities related to fire suppression, and NPS participation in USFS training opportunities.

4. Recommended Action: The monument will develop and/or maintain fire protection agreements with CDF, BLM, and USFS. These agreements will benefit both the monument's prescribed burn program and fire suppression program. Without such agreements, interagency fire suppression and related fiscal responsibilities will not be well-defined. Agreements and

meetings will keep cooperators informed of fire suppression methods in keeping with NPS resources management policy. Cooperative preplanning will cover, 1. protection of cultural resources, 2. line location which takes advantage of natural barriers to fire spread, 3. use of fugitive dye retardent around rock formations and 4. use of heavy equipment in the monument.

The park will continue to seek agreements with adjoining private landowners to cooperatively prescribe burn continuous areas of chaparral.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-2-PRESCRIBED BURNING PROGRAM.

2. Statement of Problem or Issue: Fire has generally been suppressed within the monument for several decades. As a result, chaparral vegetation has become ubiquitously mature and fuel loadings are uniformly heavy. Under these conditions, wildfires tend to be catastrophic and difficult to control.

   This problem has been partially corrected by the establishment of a prescribed burn program in the monument. However, that program has been hampered by lack of adequate manpower to conduct anything but relatively small burns. This will become even more apparent as the program moves into the more inaccessible areas of the park where larger acreages must be burned to be effective.

   Current Actions and Results: A prescribed burn program (Biswell 1976) and a fire history map (Greenlee 1981) have been prepared for the monument. In response, a prescribed burn program aimed at reducing fuel loads and restoring fire to the natural ecosystem has been initiated. The program so far has concentrated on developing acceptable tactics, training park staff, and reducing hazardous fuel loading in vulnerable developed areas. Between 1977 and 1982, 1,656 acres were burned under the monument's prescribed burn program. Prescriptions have been developed for all aspects except northern slopes. Unfortunately, these have the heaviest fuel loads and represent the greatest risk in dry years. The next step is to refine these prescriptions to favor reproduction of native chaparral species and discourage invasion of exotic annuals. Joint operations are conducted with California Department of Forestry, U.S. Forest Service, and Bureau of Land Management. The park has also cooperated with the local range improvement association in burns outside, but adjacent to the park.

   The monument's fire atlas has been completed and FIRDAT information is being generated. A T1-59 fire calculator has been obtained. Working relationships have been established with local, state, and Federal fire agencies. Excellent weather and fire behavior records are being generated and should result in more specific prescriptions.

3. Alternative Action and Likely Impacts:

   A. No action: - Considerable money and manpower will be saved in the short run. Over several years, however, it is likely that catastrophic fires would occur and require even larger sums of money and manpower to suppress. The chaparral community will continue in its ubiquitously mature state. Mature chaparral has less available browse for deer. Young chaparral supports larger herbivore populations but is not necessarily a more natural state than mature chaparral.

B. Conduct fire management program under contract with CDF or BLM - To conduct the program under contract with CDF or BLM will result in a significant increase in the cost of the monument's fire management program and make the monument's prescribed burn program vulnerable to the differing fire management priorities of those agencies. At this time, BLM has no plans to establish any fire management crews in the Pinnacles area and is not interested in assuming the monument's program. CDF has the authority to protect NPS lands, but emphasizes fire suppression and use of prescribed fire to manipulate vegetation to improve forage or to reduce hazard. Maintenance of natural communities is a secondary consideration.

C. Continue prescribed burn program at an accelerated rate - The monument's fire management plan, as required by NPS-18, will be completed and attached as an appendix to this plan. Based on the Greenlee and Biswell research and this fire management plan, the prescribed burn program will provide for appropriate cycles for each burn area. Approximately 15,000 acres of the monument have yet to be burned for the first time under prescribed conditions. About 1,000 acres per year will be burned. Such a program means that burning will be expanded to include the more dangerous summer months for north-facing slopes. Ignitions not under the prescribed conditions, but located in predetermined zones, will be allowed to continue without suppression whenever they are within prescription and whenever CDF and adjacent neighbors concur. These would be in areas identified for future prescribed burns and reasonably protected by natural and man-made fire breaks, natural, cultural, or economic values will not be threatened.

D. Continue with the spring-late fall pattern - This would provide the lowest risk option of burning, but is not consistent with the area's fire history. It appears that fires occurred during periods when the brush moisture content is lowest, the dormant period of mid-July through fall. The invasion of exotic annuals that occurred sometime after European settlement of California extended the period that chaparral will burn because these plants cure in spring and provide fine fuels. These exotics also invade recently burned areas and will reburn within several years. If prescriptions are limited to low risk periods, we will not be able to recreate the scene found at the advent of European man. Also, we have demonstrated that north slopes cannot be successfully treated with spring burning except where the dead to live ratio is very high.

E. Establish a let-burn policy, all ignitions - All ignitions, regardless of source or location, would be allowed to burn without any suppression activity. This would not be consistent with our responsibilities to protect Government facilities, the public, and park neighbors.

4. Recommended Action: The monument will accelerate its prescribed burn program, work with CDF and monument neighbors to allow selected ignitions not started under the prescribed burn program to continue, and to complete the monument's fire management plan as an action plan of the Natural and Cultural Resources Management Plan. Staff members will develop a systematic program to monitor pre and post burn vegetative succession as part of the Fire Management Plan (N-9). Prescriptions will be refined to enhance reproduction by native species and discourage the spread of exotic annuals. Fire effects will be monitored with regard to timing, frequency, duration and intensity of burns. Natural fire return intervals will be investigated and will be reflected in the FMP. Only through the implementation of all these actions will fire be effectively reintroduced into the ecosystem and the subclimax plant community of the chaparral be maintained as it was prior to the interruption of natural fire cycles by European man.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region

2. PROJECT NAME AND NUMBER: Firebreak revegetation (PINN-RM-3).*

3. STATEMENT OF THE PROBLEM: Old fire prevention policy within the national parks resulted in firebreaks being bulldozed into the hillsides of the monument. The scars of these firebreaks mar the scene and create erosion problems.

4. WHAT HAS BEEN DONE: No firebreaks have been built in the last four years.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Old firebreaks that are not healing over may require one or more methods for recovery of native ground cover.

   a. Compaction of soil by bulldozers may require plowing.
   b. Use prescribed burning to scarify seed.
   c. As a last resort, fertilization and transplanting may be needed for full recovery.

6. LENGTH OF TIME NEEDED: Two years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Erosion and soil depletion would continue, inhibiting natural vegetation recovery.

8. WHAT ARE THE ALTERNATIVES:

   a. No action.
   b. Maintain the firebreaks with periodic clearing.

9. PERSONNEL: Monument staff.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services				1,500	1,500
Other than personal services				500	500
GRAND TOTAL				2,000	2,000
Funds available in park base				2,000	2,000
Funds requested from Regional Office				___	___

On Form	Date Submitted

11. REFERENCES AND CONTACTS: FES 75-99

12. DATE OF SUBMISSION: February 13, 1976

13. UPDATE FY 1983: Since revegetative rehabilitation of the firebreaks has been progressing satisfactorily by natural means only, this project has been eliminated from further consideration.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-4-BALCONIES CAVE TRAIL IMPROVEMENT

2. Statement of Problem or Issue: A trail has been constructed through the Balconies Caves. However, there are still a few places where visitors, even with adequate lighting, have missed a turn, fallen several feet, and been seriously injured.

   Current Actions and Results: The trail receives cyclic maintenance and has been improved recently along several stretches. Warning signs stressing the hazardous nature of the caves have been installed. Warnings are also in the park minifolder. These actions have reduced injuries, as well as complaints related to the difficulty of finding the trail. However, injury and complaint levels are still unacceptably high.

3. Alternative Actions and Likely Impacts:

   A. No further action - The cave is currently passable and the majority of visitors receive an enjoyable experience. The several serious accidents and complaints each year would continue.

   B. Install a paved trail - This would reduce visitor injuries and would eliminate complaints about not finding the way. However, the cave is within the park's wilderness and this would not be a compatible action.

   C. Install lights throughout the cave - This would have approximately the same results as Alternative B, but is not compatible with the cave's wilderness designation.

   D. Close the cave - The cave is an important geologic feature of the monument and a major visitor attraction. Closure would result in strong negative public reaction. Without major alteration of the cave structure, closure would be virtually unenforceable due to the many openings.

   E. Upgrade hazardous portions of trail - Those sections which have proven to be hazardous or difficult to find will be improved using native material and concrete. The location and type of improvements will be dictated by wilderness policy and the need to provide for public safety.

4. Recommended Action: Since the cave is in a wilderness area, management actions will be held to a minimum. Visitor safety will be improved by using native material and concrete for those sections of the trail that have proven to be hazardous or difficult to follow.

5. FY 1983 Update: This project will be completed by the trail crew funded under 10-237B 35.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-5-BEAR GULCH CAVES TRAIL IMPROVEMENT

2. Statement of Problem or Issue: Directional markings along the Bear Gulch Caves Trail are confusing in places, cause inadvertent off-trail use and fail to adequately protect the visitor from extreme hazards, especially during periods of flooding.

   Current Actions and Results: The park minifolder and a one-page safety flyer provide appropriate warnings. Most of the trail has been re-worked and brought up to standard, although confusing arrows still exist on various rocks. As the result of increased safety warnings in the minifolder, visitor center, and interpretive programs, off-trail visitor injuries have been reduced.

3. Alternative Actions and Likely Impacts:

   A. No further action - Visitors will continue to use the caves and be exposed to confusing and hazardous trail conditions.

   B. Close caves trail - The Bear Gulch Caves are a unique geologic formation and are among the most visited features at Pinnacles. Closure would result in public criticism and would be difficult to enforce.

   C. Remove painted arrows - The arrows, painted on rocks, are confusing and difficult to follow. In addition, they are a defacement of a natural feature and encourage similar defacement by visitors.

      The only successful removal method will require exfoliation of the rock. Since there is considerable natural exfoliation, the damage should not be noticeable.

4. Complete repair and upgrading of trail surfaces - Approximately 50' of the trail near the east entrance consists of loose gravel. This stretch is flooded much of the year and will be raised with a hard surface for safety.

5. Recommended Action: The monument will finish upgrading trail to improve visitor safety, and remove those painted arrows that confuse the visitor.

6. FY 1983 Update: This project will be completed by the trail crew funded under 10-237B 35.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region

2. PROJECT NAME AND NUMBER: Frog Canyon Trail Construction (PINN-RM-6).*

3. STATEMENT OF PROBLEM: The only access to the south end of the monument is Chalone Peak Trail. About one-fourth of the monument land area is therefore inaccessible.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The trail will be routed to the saddle between North and South Chalone Peak, with a spur to the top of South Chalone Peak. The main trail will descend into Frog Canyon and continue down to Chalone Creek. It is possible that one or two bridges will be needed.

6. LENGTH OF TIME NEEDED: Two years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: About one-fourth of the monument's land area would be inaccessible to visitors. Hikers would have a damaging effect on the area's vegetation.

8. WHAT ARE THE ALTERNATIVES:

   a. No action.
   b. Prohibit off trail hiking.

9. PERSONNEL:

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services					35,000
Other than personal services					15,000
GRAND TOTAL					50,000
Funds available in park base					---
Funds requested from Regional Office					50,000

11. REFERENCES AND CONTACTS: FES 75-99

12. DATE OF SUBMISSION: February 13, 1976

13. UPDATE FY 1983: Due to steep terrain and a decision to complete the South Wilderness Trail from South Chalone Peak to newly acquired land in the southeastern corner of the monument, the Frog Canyon Trail is no longer under consideration.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region

2. PROJECT NAME AND NUMBER: Frog Canyon-Chalone Peak Trails Connection (PINN-RM-7).*

3. STATEMENT OF THE PROBLEM: The loop formed by the proposed Frog Canyon and the present Chalone Peak Trails will be at least fifteen miles round trip. This is too time consuming and strenuous for the average visitor.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: About one-half mile of trail over relatively easy terrain will be constructed. A bridge may be needed depending upon which side of the stream channel the Frog Canyon Trail will be on.

6. LENGTH OF TIME NEEDED: One year.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Many persons would not hike the fifteen mile long Frog Canyon Trail. This would prevent visitors from enjoying the less traveled areas.

8. WHAT ARE THE ALTERNATIVES: No action.

9. PERSONNEL: Day labor.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services					7,000
Other than personal services					3,000
GRAND TOTAL					10,000
Funds available in park base					---
Funds requested from Regional Office					10,000

11. REFERENCES AND CONTACTS: FES 75-99

12. DATE OF SUBMISSION: February 13, 1976

13. UPDATE FY 1983: Due to steep terrain and a decision to complete the South Wilderness Trail from South Chalone Peak to newly acquired land in the southeastern corner of the monument, both the Frog Canyon Trail and Frog Canyon-Chalone Peaks Trail connection are no longer under consideration.

NATURAL RESOURCE PROJECT STATEMENT

1. ANN-RM-8-NORTHERN AREA WILDERNESS TRAIL

2. Statement of Problem or Issue: Inadequate access exists into the northern third of the park. Visitors to the monument are denied access to the superlative resources and views found in this northern area. The lack of access has also hindered the monument's effort to combat poaching, cattle trespass, and illegal backcountry camping. Without improved access, the monument will also be unable to efficiently implement its overall prescribed burn program or effectively coordinate that program with the ongoing prescribed burn programs of its neighbors.

   Current Actions and Results: The trail extends from the Chalone Creek Picnic Area up Chalone Creek to the eastern edge of Section 20, R7E, T16S, and then southward to the southeast corner of Section 20.

   Monument personnel and visitors now have access along Chalone Creek from the east side of the monument, but must return by the same route due to the lack of a completed circular route via the Chaparral Ranger Station. Several historic and archeologic sites are now more accessible for study and interpretation. Increased visitor access may result in some site and artifact protection problems. Proposed NPS and BLM fuel reduction problems along the monument's north boundary will now be conducted with greater safety. Monument personnel must now program for an additional four miles of trail maintenance.

3. Alternative Actions and Likely Impacts:

   A. No further action - As stated above, monument personnel will not have adequate access to the northern wilderness area. This access problem will hinder the monument's effort to combat poaching, cattle trespass, and illegal backcountry camping; study and interpret historic and archeologic sites; and effectively and efficiently implement the fire management plan. Visitors will be faced with a dead-end trail resulting in numerous cross-country routes being created.

   B. Complete trail to Chaparral Ranger Station - The North Wilderness Trail will be completed from Section 20, R7E, T16S, to the Chaparral Ranger Station. Rangers, maintenance personnel, and visitors will have access from both sides of the monument.

4. Recommended Action: Complete the North Wilderness Trail between Section 20 and the Chaparral Ranger Station. A possible increase in poaching and illegal camping activity to the area is sufficiently mitigated by the improved access to visitors for day use purposes and to monument personnel for patrol and fire management activities.

5. FY 1983 Update: This project will be completed by the trail crew funded under 10-237 B 35.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region.

2. PROJECT NAME AND NUMBER: Trail Stabilization and Maintenance (PINN-RM-9).

3. STATEMENT OF THE PROBLEM: Trails are severely deteriorated due to short-cutting and heavy rainfall. Retaining walls are needed to maintain trail width and to restore trails cut by erosion.

4. WHAT HAS BEEN DONE: Chicken wire and barbed wire has been used in shortcuts to eliminate off trail use. Trails have been sloped and drain channels have been provided to slow erosion.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Wet or dry retaining walls will be constructed at serious shortcut and erosional sites. These will be designed to discourage shortcutting and prevent erosion. Hand rails will be provided where necessary and steps will be enlarged. All prominent shortcuts will be obliterated and plantings of native shrubs will be made to screen potential shortcuts.

6. LENGTH OF TIME NEEDED: Three years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Trails will continue to deteriorate and endanger the average hiker. In some places trails will be closed since it is not possible to reconstruct them with park funds.

8. WHAT ARE THE ALTERNATIVES:

   a. No action.
   b. Hikers could be accompanied by a ranger.
   c. Damaged trails could be closed.

9. PERSONNEL: Day labor.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services			50,000		
Other than personal services				16,000	
GRAND TOTAL			66,000		
Funds available in park base			---		
Funds requested from Regional Office			66,000		

On Form	Date Submitted
10-238	3/74

11. REFERENCES AND CONTACTS: DES 74-28

12. DATE OF SUBMISSION: August 30, 1974

13. UPDATE FY 1983: The project has been completed.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region.

2. PROJECT NAME AND NUMBER: Boundary Survey (PINN-RM-10).*

3. STATEMENT OF THE PROBLEM: No corners or markers are installed around the monument. As a result, there is no way to place fences to prevent feral hog movement, trespass grazing or hunting. Most boundaries are not precisely known.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The monument boundary will be surveyed and marked.

6. LENGTH OF TIME NEEDED: Six months.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Trespass hunting and grazing, and disputes over boundaries will continue.

8. WHAT ARE THE ALTERNATIVES: No action.

9. PERSONNEL: Contract.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence 1st	2nd	3rd	4th	5th
Personal services					
Other than personal services	60,000				
GRAND TOTAL	60,000				

Funds available in park base	---
Funds requested from Regional Office	60,000

On Form	Date Submitted
10-238	3/74

11. REFERENCES AND CONTACTS: DES 74-28

12. DATE OF SUBMISSION: August 30, 1974.

13. UPDATE FY 1983: The project has been completed.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-11-BOUNDARY FENCING.

2. Statement of Problem or Issue: Cattle trespass, feral pig damage and illegal hunting are serious threats to the native plants and animals of the monument. Cattle are attracted to the permanent water sources and grazing lands within the monument. They pollute the streams to the detriment of aquatic flora and fauna, bring in seeds of non-native species that ultimately compete with non-native species producing an unnatural ecosystem, and compete with native herbivores for available forage. The feral hog population is expanding with a concomitant increase in its impact on momument ecosystems.

Fence segments have not yet effectively reduced the number of cattle trespassing into the monument. During the grazing season, approximately 200 head of cattle can be found within the Chalone Creek/North Boundary Area, 150 head can be found within the East and South Boundary Areas, and 100 head can be found within the West Boundary Area. Thus, about 25 percent of the monument lands are grazed by cattle each year. More acreage will be similarily impacted as the monument continues to implement its fire management program and increases available forage.

Cattle fencing does not stop feral hog movement across the monument boundary. Without a complete boundary fence designed to exclude hogs there will be no way to control movement of hogs from surrounding areas into the monument should a removal program be instituted.

Sport hunters and poachers trespass into the monument. They damage vegetation by not following existing monument trails and take wildlife that is part of the unique ecosystem of the monument. This is happening despite the presence of signs along the monument boundary.

Current Actions and Results: Only 6.25 miles of the monument's 26-mile boundary have been cattle fenced. These boundary segments include .5 mile along the north edge of Section 21, R7E, T16S, .25 mile across Bear Creek near the Pinnacles Campground, Inc.; .5 mile along a ridge extending southeast from Grass Canyon to the eastern monument boundary, 2 miles through Sections 7 and 18, R8E, T17S, and Section 13, R7E, T17S, and 3 miles from the southern edge of Section 4 to the eastern edge of Section 15, R7E, T17S. In addition, two short drift fences have been constructed across Chalone Creek and one of its tributary canyons in Section 22, R7E, T16S.

In recent years, discussions have been held with the BLM regarding additional fencing along natural boundaries (e.g., ridge lines) in the vicinity of the legal monument boundary. Neither an agreement with BLM or the necessary funds to construct such a fence has been obtained.

Alternative Actions and Likely Impacts:

A. No action - If the boundary is not completely fenced feral pig intrusion and cattle trespass will not be eliminated and hunter trespass and poaching will not be reduced. Implementation of the fire management plan has already increased forage for monument wildlife, feral pigs and cattle. As the monument accelerates its prescribed burn program, an increase in cattle trespass can be expected. Until the monument is completely fenced, such trespass by cattle and the growing pig population will continue to adversely affect the terrestrial and aquatic flora and fauna of the monument.

B. Install drift fences only - The installation of drift fences only is an effective deterent to cattle trespass wherever the surrounding terrain is impassable but would not exclude the hogs since they move easily over rugged terrain. Most of the monument boundaries are so broad that drift fences will be impractical. As prescribed fires produce improved forage and eliminate vegetative barriers, more areas of the monument will become more susceptible to cattle trespass. In addition, drift fences do not adequately address the problem of hunter trespass and poaching.

C. Fence entire monument boundary - The entire boundary will be fenced to exclude cattle and hogs. If not completed, many hunters will continue to inadvertently cross onto monument lands in their quest for deer, pigs, and other game animals. As forage improves in the monument and on adjacent lands as a result of prescribed burn programs, wildlife populations and hunting pressure will increase. Much of that increase in hunting pressure will spill over onto monument lands. As forage increases and mature chaparral is eliminated as a barrier, more cattle and hogs will enter more of the monument lands. Fencing the complete boundary will prevent this from happening. Cyclic maintenance costs will be increased. The movement of native wildlife in and out of the monument will not be affected.

4. Recommended Action: The entire boundary of the monument will be fenced to exclude cattle and hogs. Boundary segments for those areas receiving heaviest cattle use will be given priority for available funds. The monument will continue to work towards an agreement with BLM for establishing fence lines along natural features wherever such fencing would improve resource protection and management within the monument and reduce fence construction costs. Existing cattle fence will be modified to exclude hogs. Fence design will allow movement of wildlife across boundary.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-12-BEAR GULCH DAM REPAIR*

2. Statement of Problem or Issue: All required repairs are completed except for repairing the drain valve. Until this valve is fixed, management has no way to control water levels behind the dam.

   Current Actions and Results: All necessary measures to insure the dam's structural soundness have been undertaken. The exposed concrete surface has been veneered with native rock. A cyclic maintenance program including dam inspection, began in FY82. The likelihood of the dam failing, and the resultant threat of harm to humans and the Bear Gulch ecosystem has been reduced to an acceptable level.

3. Alternative Actions and Likely Impacts:

   A. No further repairs - The dam is structurally sound. However, until the valve is repaired, there is no way to conduct periodic inspections of the dam's wet side. Also, management will have no way to regulate the level of the reservoir in anticipation of extreme periods of high runnoff.

   B. Repair the valve - Management will be able to maintain safe levels of water behind the dam and drain the reservoir to conduct inspections of its wet side.

4. Recommended Action: Repair of the Bear Gulch Dam will be completed by repairing the valve. Only then will it be possible to inspect both sides of the dam for structural soundness and to regulate water levels behind the dam.

5. Update FY 1983: The valve was repaired during FY 1983. This project has been completed.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-13-BEECHY GROUND SQUIRREL CONTROL PROGRAM.

2. Statement of Problem or Issue: Beechy ground squirrels (Citellus beecheyi) have reached abnormally high population densities in areas such as the Chaparral Campground and the Bear Gulch and Chalone Creek Picnic areas. The population has generally become dependent on food provided by park visitors. Predation by fox, bobcat, coyote, and badgers is discouraged by heavy visitor use in the affected areas. High populations of ground squirrels are potentially dangerous to human visitors because they are potential vectors for bubonic plague and rabies.

   Current Actions and Results: An emergency pesticide project was implemented in 1975 following a cooperative study of the problem with county health officials. Since that time, gas cartridges of sulphur have been used to asphyxiate squirrels in their burrows. Zinc phosphide has also been used for treatment. Field observations indicate that the population of the squirrel colonies, although still relatively high, have remained fairly stable since the program was initiated.

3. Alternative Actions and Likely Impacts:

   A. No action: - Beechy ground squirrel populations will increase until a transmittable disease enters the community. Erosion problems and health hazards will increase. Visitors will be discouraged from visiting and camping in heavily populated areas. Park closure may result if an epidemic passes through these populations. Continue program of control using sulphur gas cartridges and zinc phosphide.

   B. Population monitoring and gas cartridge control program - The use of gas cartridges needs to be continued on an as-needed basis. The monument will determine acceptable population levels for the squirrel colonies, establish a monitoring program, and use gas cartridges whenever population levels exceed acceptable levels. Such a program will result in acceptable and relatively stable squirrel populations, as reduced opportunity for epidemics that will threaten the public and the squirrel populations, and a reduction in vegetation damage and erosion. The use of the cartridges will restricted to periods of time when, and to locations where, fire risks are minimal.

   C. Complete eradication program using toxic pesticides - If toxic pesticides are used, there is a danger of adversely affecting other animal populations and possibly eliminating the entire Beechy ground squirrel population in the targeted colony. Although other squirrel populations would eventually expand into these unoccupied areas, the squirrel is a native species and the complete eradication of any colony is not considered desirable.

D. Public awareness program - An education program that alerts the public about the dangers in feeding or otherwise coming in contact with the Beechy ground squirrel will be implemented. Additional signs will be placed in picnic areas and campgrounds, brochures will be given to visitors as they pass through the visitor contact station, and monument personnel will orally reinforce such written material whenever public contacts are made. These actions will reduce the squirrels' dependence on food from the visiting public and reduce the potential for the transmittal of vector disease from the squirrels to man. However, monument personnel involved with this accelerated public education program will have less time available for other projects.

E. Reduce colony populations through the use of live trapping - Although live traps can be used to remove rodents from targeted areas, placement of captured rodents into other areas would upset the natural ecosystem of those areas. Past experience with live trapping has proven to be ineffective and very manpower intensive.

F. Reduce populations by shooting - The California Department of Fish and Game has demonstrated that shooting squirrels is effective and require less manpower than any alternative except no action. However, such an action would pose a serious safety hazard to the public and result in considerable negative reactions from visitors. Furthermore, the abundance of carcasses would likely exceed the capacity of the decomposers and could lead to health risks to the public.

4. Recommended Action: The monument will continue its use of gas cartridges to control Beechy ground squirrel populations in high visitor use areas. The timing and magnitude of use will be determined by a population monitoring program established by monument personnel. An accelerated public awareness program will also be implemented. Through the implementation of all three of these actions, the squirrel populations will be controlled and the health and safety risks to monument visitors will be minimized.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-14-WILDERNESS PROGRAM WITH BLM.

2. Statement of Problem or Issue: Ten and one-half miles of the 26-mile monument boundary is adjacent to lands administered by the Bureau of Land Management. Most of the monument lands along those common boundaries are designated as a wilderness area. Under such a designation, the National Park Service permits day-use visitation only and undertakes management activities that will protect and perpetuate the geological and ecological values for which the monument was established. Such activities include a fencing program that will control cattle trespass, feral hog movement into the monument and poaching (see RM-11), a fire management program that will help maintain a natural ecosystem and reduce the possibility of uncontrollable and destructive wildfires (see RM-2), and an evaluation of the impact of climbers on the rocks, vegetation and raptors (see RM-20).

BLM administered lands are managed under a multiple use concept. There is no requirement for compatible management with NPS wilderness lands. Much of these BLM lands are under leases for cattle grazing and are subject to the impacts of mining and chaining and to a fire management program that does not require the maintenance of native ecosystems. Such a management philosophy makes it difficult for the NPS to ensure that its protection and preservation objectives will continue to be met.

Current Actions and Results: Adjacent BLM lands are under formal review for wilderness classification and both Pinnacles and District BLM officials have indicated interest in joint management of the lands. In addition, recent legislation allows approximately 4 miles of PINN-BLM boundary to be adjusted along natural features. The north, east, and west boundaries have been scouted for other appropriate boundary changes.

3. Alternative Actions and Likely Impacts:

A. No further action - Incompatible uses of BLM lands adjacent to NPS wilderness could result. Management of certain watersheds will remain difficult or impossible. Increased risks will be required to conduct the fire management program. Fencing of the park's boundary (RM-11) will be impossible in certain locations due to the steep terrain.

B. Develop joint land use plan with BLM - Pinnacles will pursue the development and acceptance of a land management plan with BLM that emphasizes cooperation toward compatible watershed and fire management programs. Fencing will be located along lines of accessible terrain and will provide protection to the lands of both agencies. Coordinated fire management and fencing programs will cost taxpayers less than uncoordinated and duplicated programs. Watersheds will be managed as complete entities and prescribed burns will be conducted without the constraints of political boundary. Since new fence lines

and wilderness management policies, in some areas, will extend onto BLM lands, local hunters and ranchers could react negatively. An aggressive public information program will have to be conducted by both agencies.

4. Recommended Action: Continue to seek joint land management agreement from BLM. Without such an agreement, it will be difficult, if not impossible, to construct a fence along existing Pinnacles boundaries and, subsequently, protect the natural values from trespassing cattle, feral hog movement, hunters, and campers, conduct a fire management program with minimal risk to adjacent lands, and minimize the introduction of exotic plants and animals.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-15-DODDER CONTROL (Cuscuta brachycalyx)

2. Statement of Problem or Issue: This parasite was first observed at Pinnacles in 1974, along Highway 146, on the east side of the monument. Since that time it has spread along all roads in the park and is now spreading up the Chalone Creek watershed at the end of Highway 146. To date, the primary host observed has been California Buckwheat (Eriogonum fasciculatum). The plant initially weakens the host, killing it over a period of 2-4 years. A subspecies of the California Buckwheat, (Eriogonum borttonii Greene) has recently been identified and is believed to be found only at Pinnacles. No infestation of the subspecies has been observed so far.

Current Actions and Results: Dodder has been monitored along the roads in the eastern part of the monument. Infestation is spreading along road corridors at about 1-1/2 km/year. Several colonies of California buckwheat have been damaged and a few have been killed.

3. Alternative Actions and Likely Impacts:

A. No action - Infestation will continue and the California buckwheat may eventually be eliminated from the park. In addition, the recently discovered subspecies of California buckwheat may be attacked and destroyed.

B. Apply poison - Several herbicides are available to combat the infestation. However, all are likely to remain in the environment and none are species specific. There is also significant danger to employees handling the poisons.

C. Burn the dodder - There is no indication that fire spreads dodder. Therefore, the monument will eliminate dodder through its established fire management program. This action will entail little extra time. Although fire will destroy buckwheat colonies along with the dodder, buckwheat is a prolific seeder and will re-establish itself from adjacent non-burned colonies.

D. Maintain a dodder monitoring program - The monument will continue to monitor the spread of dodder and its impact on California buckwheat, its subspecies, and other species.

E. Remove dodder by hand - This action will require more labor than currently available. The method will avoid damage to other plants, but will fail to completely eliminate the dodder and its threat to the California buckwheat.

4. Recommended Action, Monument personnel will continue its dodder monitoring program and experiment with prescribed burning to eliminate dodder from targeted areas. These two actions will provide the greatest protection of the native plants of the monument, while requiring no additional workforce. Personnel will investigate the method of seed dispersal and the reasons why infestation is most common along transportation corridors and other disturbed areas.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-16-SOUTH WILDERNESS TRAIL

2. Statement of Problem or Issue: The south half of the park, a wilderness area, has limited trail access. This effectively limits visitor use and hampers management plans for prescribed burns, archeologic site protection, and cattle trespass control.

   Current Actions and Results: Approximately 1.2 miles of trail has been completed from North Chalone Peak to South Chalone Peak. Approximately 3 miles of trail has been completed from the Bear Gulch Trail, south along Chalone Creek. Boundary adjustments have been made to insure access for park staff and monument neighbors. Original plans to construct the trail in Frog Canyon have been abandoned due to extremely difficult terrain and incompatibility with expanded prescribed burn plans.

   Some of the southern portion of the park is now accessible for carrying out management and resource protection programs. Visitor use is still minimal since the new trail portions are not connected or publicized. Cyclic maintenance has been increased due to the additional miles of trail.

3. Alternative Actions and Likely Impacts:

   A. No further action - Access into the rugged southeastern section of the park will be difficult. Future prescribed burn plans will be altered due to the lack of access for crews and supplies. Management of cultural resources in this area will be hampered.

   B. Complete trail from South Chalone Peak to the SE corner of Section 13 - This will require about 2 miles of trail construction through heavy chaparral. This will open the entire southern end of the park for both resource management projects and visitors. This option may require construction of approximately 1/2 mile of trail from BLM land in order to avoid very steep terrain within the park.

   C. Complete trail from South Chalone Peak to Chalone Creek, along south flank of Mt. Defiance - This will allow the trail to remain completely within the park, but require about 3 miles of trail construction across extremely steep terrain and at significantly higher construction costs. The SE corner of the park would still not be accessible for management purposes.

4. Recommended Action: Complete the trail from South Chalone Peak from Section 13. This is the shortest route and involves less severe terrain than other possible routes. No difficulty is anticipated in reaching agreement with BLM to cross its land. This action will provide a loop wilderness trail and thereby give the visitor an opportunity to enjoy the natural resources and views of the southern sections of the monument.

5. FY1983 Update: This project will be completed by the trail crew funded under 10-237B 35.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-17-AIR QUALITY MONITORING

2. Statement of Problem or Issue: Approximately 80% of Pinnacles was designated a Class I air quality area under the Clean Air Act amendments of 1977. An integral part of the visitor's experience is the panoramic vistas from the high points within the designated wilderness areas. Under the Clean Air Act, the Service has an affirmative responsibility to protect visibility and other air quality related values affected by air pollution. Continued growth of industry, population, and agriculture in the Salinas and Santa Clara Valleys are expected to threaten monument air quality in the near future. The monument's prescribed burn program causes short-term increases in air-borne particulate matter. During the peak visitor-use season, traffic congestion results in significant short term deterioration in air quality. There currently is no program to measure particulates, ozone, NOx, SOx, etc. Consequently, management has no data, other than visual assessments by staff members, on which to base air resource management decisions.

Current Actions and Results: Integral vistas have been identified and photographed. The fuel consumed in tons/acre, the direction of the smoke column, and the dispersal rate estimates for each prescribed burn in the monument is recorded. Burn/no burn conditions established by the Monterey Bay Unified Air Pollution Control District are complied with. Management has a photographic base for determining deteriorating visual quality of the air on adjacent lands. The park burn program is in compliance with regional air quality regulations. No data is available on gaseous pollutants such as ozone, NOx and SOx; during peak visitation periods these pollutants mayu be concentrated enough to damage both historic and non-historic structures and materials.

3. Alternative Actions and Likely Impacts:

A. No further action - Management would lack statistical evidence regarding changes in air quality and resulting vista impairment. Flora, fauna, geologic features, and man-made structures will likely be damaged as airborne pollutants increase.

B. Determine air quality from stations outside the park - Quantitative data from outside stations could be used in conjunction with known wind patterns to predict the monument's air quality. Known stations are currently 10 miles outside the park and would not reflect the effects of prescribed burns or high concentrations of vehicles during peak visitation periods.

C. Continue visual observations - Quarterly photographic records from the established integral vista points would not indicate general trends in visual air quality; they would only be single-event records and would quite likely reflect unique rather than average events. Evaluation of other air quality elements would be subjective and significant damage could occur to natural and man-made resources before being detected.

D. Establish a monitoring program within the monument - Key indicator species will be identified and monitored on an established schedule. A station will be equipped to monitor at least ozone, particulates, and rainfall pH. This will provide current air quality information and permit the monument to develop counter-measures before a particular pollutant reaches a damaging level.

4. Recommended Action: The monument will establish an in-park monitoring program that will be supplemented with available data from other stations in the Salinas-Santa Clara Valley area. Thus, air pollution levels at both the monument and regional levels can be correlated to determine trends and interrelationships.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-18-MISTLETOE MONITORING PROGRAM

2. Statement of Problem or Issue: A plantation stand of digger pine (Pinus sabiniana) in Bear Gulch is infested with dwarf mistletoe (Arceuthobium campylopodum) colonies. Some infection of nearby native digger pines has occurred.

   Current Actions and Results: No management action has yet been taken. The infestation has spread throughout the entire plantation with resulting loss of vigor among the pines. Infestation has been observed outside the stand in nearby trees. As infected trees weaken, they could become host to other parasites and insects.

3. Alternative Actions and Likely Impacts:

   A. No action - The stand of planted digger pines will likely continue to decline in vigor and could eventually become weakened enough for another agent to kill it. The loss of the stand would not be critical since it was planted by man years ago. Mistletoe has infected nearby native digger pines. As digger pine density increases the parasite could spread gradually to other groups.

   B. Monitor stand - Periodic monitoring by rangers will be conducted to determine overall vigor of the planted digger pines, spread of the mistletoe, and presence of previously undetected insect or parasitic flora species. Surrounding native pines will be monitored for further mistletoe infestations. Should mistletoe be found outside the current infected area, or should new pests be detected in the pines and deemed a threat to native flora, an eradiction program will be implemented.

   C. Implement a mistletoe eradication program - The monument will completely eradicate the colonies of mistletoe. This will be accomplished only after a determination of the most effective and efficient methods available. Such a program will eliminate the possibility of mistletoe spreading to other digger pines in the monument and reduce the possibility of other parasitic insects or plants becoming established in a weakening stand.

4. Recommended Action: Mistletoe spread is density dependent. Spread occurs only where trees are close enough that the propagules, forcefully ejected from the parasite, can hit a new host. Increased digger pine density could lead to the spread of mistletoe. Prescribed burning thins trees and lessens the possibility of spread. At the present time, the threat posed by this infestation is not serious enough to warrant the high costs of eradication. Therefore, a monitoring program will be implemented aimed at the health of the plantation Digger Pines, the spread of mistletoe within the plantation pines and to native Digger Pines, and the presence of previously undetected parasitic species of insects and plants.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-19-TRAIL STABILIZATION AND MAINTENANCE

2. Statement of Problem or Issue: Park trails are severely deteriorated due to shortcutting, seasonally heavy rainfall, overuse, and poor design. This presents a serious safety hazard to hikers, has accelerated soil erosion rates and has resulted in gullying between switchbacks and destruction of vegetation..

   Current Actions and Results: Previously installed chicken wire and barbed wire have been removed. Sixty-six thousand dollars was obtained under PINN-RM-9 and the High Peaks trails were repaired. Several rock and log retaining walls have been installed on other park trails. A shortcut control program has been implemented using specially designed signs, written handouts, formal interpretive messages, and brush barriers. The shortcut areas have shown good recovery and the rate of soil and vegetative damage has slowed. Cyclic maintenance has been established for the entire trail system and plans are underway for maintenance personnel to receive formal trail maintenance training. Approximately 15 miles of trails still suffer severe deterioration and need treatment. Attempts at transplanting to create live brush barriers have been unsuccessful.

3. Alternative Actions and Likely Impacts:

   A. Take no further action - Popular, high use trails which have received only limited attention, such as Moses Spring and Balconies, will continue to deteriorate. Shortcutting will continue to damage soil and vegetation. Cyclic maintenance will continue to be inadequate due to lack of trained personnel.

   B. Close damaged trails - This will result in closing several of the most popular trails on both sides of the park, including the Balconies Cave. Negative public and political reaction could be expected.

   C. Continue with cyclic maintenance only - If properly trained personnel can be obtained, cyclic maintenance would likely reduce most trail deterioration to an acceptable level. Repairs of current deterioration would not occur, resulting in a safety hazard. Some trail sections would be closed.

   D. Continue trail stabilization and cyclic maintenance - Install wet or dry retaining walls at serious shortcut and erosion sites repair trail treads and eliminate switchbacks where practical. Once trails are brought back to standard, cyclic maintenance should be able to arrest future deterioration. Aggressive shortcut prevention activities will be continued.

4. Recommended Action: The monument will continue stabilization and repair of deteriorated trails. Park staff will develop expertise in trail maintenance through formal training. The aggressive shortcut prevention and repair program will continue. Funding is appropriate under the Park Restoration and Improvement Program since trail repair will ensure safe visitor access to the monument core. Failure to stabilize these trails will result in accelerated resource damage and the repair costs will rise as a result.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-20-IMPACT OF CLIMBERS ON THE RESOURCES OF PINNACLES

2. Statement of Problem or Issue: From September to May of every year, the rock formations of Pinnacles National Monument are heavily used by rock climbers. The monument does not require any visitor venturing away from the developed areas to indicate his or her destination or activity, so the number of climbers using the monument is difficult to count.

However, the impact of these climbers on the rock walls, native vegetation, and erosion levels is quite visible. While there are dozens of climbs in each of the major climbing areas (i.e., Reservoir Area, High Peaks, and Machette Ridge), there are only a few designated and maintained trails providing access. Climbers have produced a maze of primitive routes to and around most of the rock formations, thus destroying native vegetation and making the areas more susceptible to erosion. In addition, some rock walls in the momument are littered with equipment left behind by climbers and have visible holes and chips caused by the removal of some climbing equipment.

Although there are no known peregrine falcon nests within the monument, the area is considered habitat for the endangered species. The impact of climbing activity on potential peregrine falcon nesting or foraging in the monument is unknown.

Current Actions and Results: The Climbers Guide to Pinnacles is sold at the Pinnacles Visitor Center. The newly published guide shows a picture of the special logo that will be used to mark designated trails to the base of the climbing routes throughout the monument. It also mentions the new registration system to be implemented for climbers in the monument. Monument staff has been able to contact only a small percent of climbers to stress the importance of following existing trails and either using equipment that has been left in the walls or using equipment in cracks that will not result in further damage.

3. Alternative Actions and Likely Impacts:

A. No action - The monument will monitor only the number of visitors to the monument without regard to activity or destination. Park personnel will not have sufficient information to inform climbers of low-use climbing areas or to quantitatively correlate visitor use data with future resource damage. Unplanned routes between the main trails and rock formations will continue to expand, resulting in damaged vegetation and increased erosion.

B. Establish a resources monitoring program - Monument personnel will implement a monitoring program that establishes transects along which changes in the vegetative cover and soil erosion can be monitored. A program to monitor the impact of climbing on the rock formations will also be implemented. To determine any relationship between the

findings of these monitoring programs and the level of climbing activity in the monument, a voluntary climber registration system will be established. The system will collect information on the numbers and destination of all climbers. This three-fold program will enable management to better serve the park visitor while protecting its unique geologic and ecologic resources. The collection of registration information (i.e., number in group and location of climbs) will be a slight imposition on the climbing public. The collection and analysis of registration and monitoring data will require additional staff time.

C. Establish a climber-oriented education program - Monument personnel will select and mark routes between the main trails and popular rock formations and encourage climbers to use them. Staff time will be required to identify and mark these routes. The monument will encourage the author of the "climbers guide" to include a statement regarding the use of these routes. Monument personnel will also, through the "climbing guide" and personnel contact, encourage climbers to avoid using equipment or techniques that will damage the rocks. Such an outreach program will alert the climbers to possible damage than can be caused by not following marked routes and by using certain equipment.

D. Peregrine falcon study - A study will be undertaken to determine critical peregrine falcon nesting and habitat areas (see N-5). Should such nesting and habitat areas be found in the monument, climbing activities could be adjusted to avoid any adverse impact on this federally listed species.

4. Recommended Action: The monument will establish a four-part program to minimize future impacts on the rock formations, vegetation, wildlife, and soil erosion. They include (1) a voluntary climbing registration system which will allow the monument to collect information on the numbers and destination of all climbers, (2) an accelerated public outreach program that will encourage climbers to use marked routes to and from the rock formations and avoid using equipment or techniques that will damage the rocks; (3) monitoring programs that will identify additional impacts to the rock walls and quantitatively determine the impact of climbers on vegetation; and (4) a research program that identifies critical peregrine falcon nesting and habitat areas (see N-5).

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-RM-21-OAK REPRODUCTION MONITORING

2. Statement of Problem or Issue: Lack of reproductive success is a recognized but little understood problem in deciduous oak stands. No evaluation of the age class structure of deciduous oak stands has been made at Pinnacles.

   Current Actions and Results: Monument staff are conducting a search of the scientific literature concerning oak reproduction in California. Staff will work with Santa Monica NRA to take advantage of the result of their more extensive research program.

3. Alternative Actions and Likely Impacts:

   a. No Action: The status and health of oak stands are unknown. If reproduction is unsuccessful and no action is taken, oak stands will eventually become senescent and the seed source will be lost.

   b. Develop an in-park monitoring program: Map location of seedlings and age classes in valley oak stand in Bench area and in selected blue oak stands. Build small exclosure areas if determined feasible by the Superintendent.

   c. Delay action until Resources Management Specialist is on staff: No base data will be available for the Resources Management Specialist to use and he/she will be required to spend much time working to acquire needed data.

4. Recommended Action: Record valley oak reproduction on the Bench starting in the summer of 1983. Record and map reproduction under the and around oak trees. Until feral hogs and cattle trespass are excluded from the area by fencing (RM-11) build small exclosure areas around selected seedlings. After the feral hogs and cattle trespass have been eliminated by fencing, continue monitoring seedlings to gauge reproductive success. Take further action if necessary. A monitoring program is within scope of present park staff. The monitoring program will provide a data base for the Resource Management Specialist to work with.

B. Natural Science Program

1. Overview and Needs

We will never know the original composition and distribution of ecosystems in the Pinnacles. A reasonable reconstruction can be made using historical records, photographs, and field research. The natural science program includes research projects that will yield retrievable data describing the natural systems found in Pinnacles today. This data will be an invaluable tool for park managers. It will allow them to (1) record measurable change over time, (2) make comparisons between conditions today and these postulated to have occurred in the past, (3) better understand natural succession and the regulatory role of natural processes in the monument, (4) use scientific knowledge to interpret the monument for visitors, (5) identify and mitigate potential impacts, (6) monitor populations of endangered species, (7) locate improvements with minimum impact and (8) make management decisions based on knowledge of the resources.

To date, at least 500 species of plants have been identified and catalogued. A fire history map has been completed. Additional research that will be conducted includes the following:

Plant Survey and Vegetation Map	(N-1 and N-8)
Entomological Survey	(N-2 AND N-8)
Limnological Inventory	(N-3 AND N-8)
Mammal Inventory	(N-4 AND N-8)
Endangered Species Study	(N-5 AND N-8)
Feral Pig Research	(N-8)
Bird Inventory	(N-8)
Herpetological Study	(N-8)
Soils Survey	(N-8)
Fire Ecology Monitoring	(N-9)

All but the soils survey will be designed to identify native and exotic species and determine their numbers, distribution and interrelationships with other plants and animals in the monument. The soils survey will identify and map the soils of the monument and determine the impacts from current actions and the potential impacts from future actions on the soils and related erosion in the monument. It will allow identification of soil-vegetative relationships.

Failure to encourage research of this kind would constitute both disregard of NPS policies regarding natural areas and mandates enacted by Congress concerning the National Park Service. Research will produce valuable management tools which will eliminate much guesswork and aid in producing a high management standard for the monument and its resources. It will influence the future directions the monument takes in managing and protecting visitors, rare and endangered plants and animals, air and water quality, and other physical and ecological resources of the monument. Research findings will also guide the monument in implementing its development plans. Without such

information, many monument development and management actions could inadvertently destroy an important resource.

2. Following is a summary list, including current status, of the major natural science projects for Pinnacles National Monument. Detailed project statements for each can be found on the pages to follow:

Project No.	Project Title	Status	Date Final Proposed
N-1	Plant Inventory	in-progress	1974
N-2	Entomological Inventory	in-progress	1974
N-3	Limnological Inventory	in-progress	1974
N-4	Mammal Inventory	in-progress	1974
N-5	Endangered Species Study	in-progress	1974
N-6	Fire Management Research	completed	1974
N-7	Water Resources Inventory	see WR-1	
N-8	Feral Pig Research	proposed	1977
N-9	Fire Ecology Monitoring	in-progress	1983

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-1-PLANT INVENTORY

2. Statement of Problem or Issue: The last vegetation map of Pinnacles was completed in 1936. Inventory of the monument's flora is incomplete. Without realizing it, management actions may be adversely affecting plant communities or rare, endangered, or undiscovered species. Similarly, exotic plants and animals may be adversely impacting significant communities and native species. Management cannot take appropriate actions or adequately control exotics until more information is available about the vegetation and plant species native to the monument. Staff cannot document vegetative change over time without basic vegetative mapping.

   Current Actions and Results: Prior to 1980, 186 species were identified and catalogued in the monument's herbarium. Since then, a VIP with an interest in botany has added another 300 species. Although this plant inventory has increased substantially in the past three years, it is not considered to be exhaustive. Species recovery and composition within recently burned areas is being monitored; this program is providing additional information to the monument's data base.

3. Alternative Actions and Likely Impacts:

   A. No further action - Management will not be provided with the necessary data to conduct park development and resource management programs. Native vegetation may be adversely affected by such programs and by exotic plants and animals.

   B. Continue to have the VIP identify and catalogue plants - Although this has resulted in a significant increase in the number of plants inventoried, it is possible that significant species will be missed. Species will not be grouped into plant communities.

   C. Conduct comprehensive plant inventory and vegetation map - The Remote Sensing Division of the Denver Service Center will prepare a map that illustrates the distribution of the various plant communities within the monument. This product will provide a data base and allow standardization of data collection.

4. Recommended Action: A comprehensive plant survey and vegetation map will be completed. Collections in the herbarium will be verified. The vegetative map will complement earlier fire-related research by Greenlee and provide the park with a more comprehensive understanding of the distribution and interrelationships among plant communities, individual plant species, and native and exotic wildlife.

5. FY83 Update : Vegetative mapping will be completed. Permanent vegetative transects will be established by the Cooperative Studies Unit, University of California at Davis, as part of comprehensive sampling to determine the effect of feral pigs on monument resources. Monitoring of vegetation will continue on a regular basis along these permanent transects.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-2-ENTOMOLOGICAL INVENTORY

2. Statement of Problem or Issue: A comprehensive inventory of the monument's insect population has never been conducted. There is limited information regarding the species and their interrelationships with plants amd animals of the area or the effect the monument's prescribed burn program will have on them. Management actions may inadvertently eliminate one or more of the insect populations, which, in turn, would affect other elements of the ecosystem. In addition, management lacks the data to identify non-native insects and to determine what impact exotic animals may have on native insect populations. Insects and other invertebrates may supply necessary protein in the diets of feral hogs, an exotic species which is expanding in range and population in the monument.

   Current Actions and Results: A small entomological collection is maintained at headquarters and casual observations by staff members are recorded. However, this information is still insufficient for monument planning and management programs.

3. Alternative Actions and Likely Impacts:

   A. No further action - Knowledge of the park's insect population will continue to be inadequate. Effects of various insect species on other native species will be inadequately understood, or unknown. Exotic plants and animals may adversely impact native insect populations and indirectly, affect critical biological relationships that may exist.

   B. Conduct an extensive inventory - The NPS' Cooperative Park Studies Unit, University of California at Davis, will conduct a comprehensive inventory of insects within the monument and expand the monument's existing insect collection. Such information will assist the monument to more effectively carry out its development, resources management and interpretive programs, including those related to the prescribed burn and exotic plant and animal control programs, without inadvertently affecting individual insect populations and their relationships with other species.

   C. Continue to have monument personnel add to the insect list and collection - Monument personnel do not have the expertise or the time to conduct a comprehensive inventory of insects. Relatively few species will be added to the monument's collection. Development and management programs will continue to be implemented without knowing what impact they may have on insect populations. The impact of exotic plants and animals on the insect populations will not be known.

4. Recommended Action: A comprehensive inventory of monument insects will be completed by NPS scientists. Interrelationships among identified insects and other native and exotic animals and plants will be determined. Management will be able to reduce the impact of its programs on the insect populations of the monument. This project will be completed as part of a comprehensive program to determine the impact of feral hogs on monument resources. Information will be collected along permanent transects. Sampling will continue at intervals as part of the resources management program.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-3-LIMNOLOGICAL INVENTORY

2. Statement of Problem or Issue: Riparian areas are among the most heavily visited and impacted resources in the monument. Most of the monument's development is located in these areas (e.g., Bear Gulch and Chalone Creek). The waters that flow through these areas also support a myriad of plants and animals. However, the lack of information about these fresh water species, their dependency on the water, and their interrelationships with other native and exotic plants and animals makes management and interpretation difficult, if not impossible. Without such information, species, including those that may be rare and/or endangered, would be adversely affected.

   Current Actions and Results: A cursory examination of the monument's aquatic resources was conducted in 1979 by the California Department of Fish and Game, utilizing electroshocking. Accordingly, the identify and range of the more common aquatic animals is known, although their specific life cycles have not been addressed. No comprehensive inventory of aquatic plants has been conducted.

3. Alternative Actions and Likely Impacts:

   A. No further action - No additional information about the aquatic resources of the monument will be obtained. Consequently, management will not be provided with necessary data to assess potential impacts from visitors, exotics, and management. Interpretation will continue to be based on limited and perhaps inaccurate information. Rare and/or endangered species may be inadvertently impacted, and the life cycles of common species may be interrupted.

   B. Conduct inventory of fresh water species - The NPS' Cooperative Park Studies Unit, University of Californiat at Davis, will conduct a comprehensive inventory of the aquatic resources of the monument. Products will include the identification of, and interrelationships among, species in and adjacent to the fresh water resources of the monument. The study will assist management to assess the impact of monument development, management, and public use on these resources. It will also indicate the extent to which exotic plants and animals adversely affect the individual native aquatic species.

4. Recommended Action: A comprehensive inventory of the monument's aquatic resources and their relationships with other native and exotic plants and animals will be prepared. Such an inventory will guide the monument in future development, management, and interpretive programs.

5. FY1983 Update: This inventory will be completed as a part of a comprehensive project to survey the impacts of feral hogs on monument resources. Information will be collected along permanent transects. Sampling will continue at specific intervals along these transects as part of the resources management program.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-4-MAMMAL INVENTORY

2. Statement of Problem or Issue: Data concerning species presence, range, population size, and interrelationships with other native and exotic species, is lacking. Some native species are no longer found within the park and others may be in danger of being extirpated. Others may be proliferating too freely as the result of other management programs and could lead to habitat or population damage. Intrusion by feral or exotic species may go unnoticed.

   Current Actions and Results: A sighting file is maintained by rangers, with occasional visitor input. It provides a fairly good indication of the presence of the more common daytime mammals, but not of nocturnal or rare species. Attempts are being made to reduce access by domestic stock (RM-11 Boundary Fencing) which compete with natives for available forage, and to develop a control program for known ferals (N-8 Feral Pig Research).

3. Alternative Actions and Likely Impacts:

   A. No further action - Rare or endangered species could become extinct without management's knowledge. Other species could reach problem proportions before effective control programs are implemented, resulting in habitat damage. The extent of competition between native and feral animals currently in the monument will continue to be unknown. Additional feral and exotic species could intrude and become established, to the detriment of native species.

   B. Conduct mammal inventory - A native mammal population dynamics study will be conducted. Such a study will provide data concerning life cycles and species interrelationships. Management will then be able to develop programs that protect mammals within the monument from the adverse impacts of man and the introduction of exotic animals.

4. Recommended Action: The NPS' Cooperative Park Studies Unit, University of California at Davis, will conduct a comprehensive inventory and population dynamics study of the native mammals in the monument. Sufficient data will be collected and analyzed to assist with the monument's development, resources management, and interpretive programs.

5. FY1983 Update: The NPS Cooperative Park Studies Unit, University of California at Davis, will complete a mammal inventory as part of a comprehensive study to determine the impacts of feral hogs on monument resources. Data will be collected along permanent transects. Animals can be censused at regular intervals as part of the resources management program.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-5-ENDANGERED SPECIES STUDY

2. Statement of Problem or Issue: Current knowledge of endangered species within the monument is extremely limited, due to the limited data on the monument's flora and fauna. Certain management programs may threaten existing species now living in the Pinnacles. Prescription burning (see N-6), trail construction and imminent park development projects all pose potential hazards to endangered species. Without research, certain species may be lost through mismanagement and the National Park Service would be liable to lawsuits by special interest groups. However, with the proper research, management will be able to take corrective action aimed at preserving those endangered species and preventing litigation or violation of federal statutes.

Current Actions and Results: Current management programs (such as prescription burning) are very possibly endangering several species within the park. The prescription burning program which has been in operation since 1976, is designed to benefit the chaparral plant community. Lack of fire in chaparral delays reproduction by chaparral plants, some of which could be classified as endangered species.

A Volunteer-in-the Parks (VIP) is currently conducting an inventory of the botanic community in the monument, and has located two species which are on federal or state lists. Several recent reports of the endangered peregrin falcon have been investigated, but these sightings remain unsubstantiated. In the past, the California condor, a federally listed endangered species, has been recorded near the park, this bird may still use the park on occasion.

3. Alternative Actions and Likely Impacts:

A. No action - Endangered species within the monument will continue to be in peril and management programs may unknowingly be conducted to the detriment of threatened species. The National Park Service will be liable in court for any detrimental effects it will have on the endangered species in Pinnacles National Monument. In addition, management will not be able to identify or evaluate possible impacts on endangered species caused by competitive or destructive exotic plants and animals.

B. Perform localized inventory of species within the areas of known impact or development - Localized inventories would provide some protection of species in areas of planned disturbance. However, this alternative fails to deal with seasonal movement of species between habitat zones and fails to observe the consequences of disturbance of one zone upon adjacent areas.

C. Partial survey of species within the monument - A complete survey and inventory of one or more of the monument's biotic groups would provide management with a partial list of endangered species which require protection. However, it is difficult, if not impossible, to prioritize one biotic group over another for inventory. All groups within the monument may have species which are endangered. Inventories of plants, mammals, reptiles, amphibians, birds, insects, and aquatic species, are all of great importance to a comprehensive resources program.

D. Parkwide inventory of all potential endangered flora and fauna - Although time consuming, this option would provide management with a sufficiently broad and relatively exhaustive data base upon which to develop plans and conduct programs without damaging rare and/or endangered plants and animals. It will also permit the monument to identify and evaluate possible impacts on such species by exotic plants and animals. This study will be conducted by the NPS' Cooperative Park Studies Unit, University of California at Davis.

4. Recommended Action: A comprehensive, monument-wide inventory of endangered and rare plants and animals will be conducted. Development, visitor use, interpretive, and resources management programs will benefit from such a list, their distribution within the monument, and their interrelationships with other plants and animals.

5. FY1983 Update: The recommended inventory will be conducted as part of a comprehensive study of the impacts of feral hogs on monument resources. After the location and mapping of populations is complete, efforts to determine habitat requirements can begin, as mandated.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Pinnacles National Monument, Western Region

2. PROJECT NAME AND NUMBER: Fire Management Research Program (PINN-N-6).*

3. STATEMENT OF THE PROBLEM: Implementation of the prescribed burning program (PINN-RM-2) necessitates further research and monitoring concerning fire behavior and chaparral ecosystems.

4. WHAT HAS BEEN DONE: On December 3-5, 1975, a meeting on the fire management program was held at the monument. Participants included several NPS scientists involved with fire management, and representatives of the California Division of Forestry, Bureau of Land Management, San Benito County Range Improvement Association, and the San Benito County Farm Advisor. Field tours were conducted and discussions held concerning the direction of the preliminary fire management research program.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

   a. Consult existing research and similar programs.
   b. Test various prescriptions of weather, fuel and topography.
   c. Continuous monitoring of fire behavior and its effect on the chaparral ecosystem.
   d. Develop a long range plan, detailing the rotation period, optimum burning periods, means of obtaining adequate prescriptions for burning and monitoring of burns.
   e. Detail specific burn sites and time periods where research burns will take place.

6. LENGTH OF TIME NEEDED: Three years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Prescribed fires may be conducted without knowledge of the most effective methodology, thereby increasing potential for detrimental results. Important alternatives involving procedure and recovery may be overlooked due to lack of research and consultation.

8. WHAT ARE THE ALTERNATIVES: No action.

9. PERSONNEL: Monument and Regional staff, and University personnel.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	1,900	9,000	9,000		
Other than personal services	5,100	6,000	6,000		
GRAND TOTAL	7,000	15,000	15,000		

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Funds available in park base	---	---	---		
Funds requested from Regional Office	7,000	15,000	15,000		

On Form	Date Submitted
10-237	6/74

11. REFERENCES AND CONTACTS: FES 75-99

12. DATE OF SUBMISSION: February 15, 1976

13. UPDATE FY 1983: Research by Greenlee was completed in 1979. Tests for prescriptions for north slopes have been completed. This research is now the basis for a draft fire management plan. This project is complete. Ecological research will continue under PINN N-9.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-8-FERAL PIG RESEARCH PROGRAM

2. Statement of Problem or Issue: Feral pigs were introduced into the northern part of San Benito County in the 1870's. They were not found anywhere else in the county until about 1955 when wild boar were introduced by several landowners, and the two populations interbred. By 1975, the feral pig's range had increased to over 54% of the county, including lands which would eventually become part of Pinnacles National Monument. Between 1970 and 1978, the resulting wild boar phenotype (Sus serofa) was occasionally observed by park staff in the Chalone Creek drainage south of Highway 146 and on lands along the San Benito-Monterey County line (T17S, R7E, Sec. 5). Between 1978 and 1980, these lands were included in the monument. As a result of this new protection, the pig population and its range appear to be rapidly increasing each year.

Today, feral pigs are sighted throughout much of the monument. Their rooting activities are most frequently observed on approximately 6,000 acres of the monument within the Bear Gulch and Chalone Creek drainages. Fewer observations are made in the inaccessible portions of the monument, but this is a result of the method of data collection and does not necessarily indicate lower population levels. Rooting is found in all the oak woodland areas in the monument, near all permanent water and in most drainages. Use is concentrated in oak woodland in winter and spring. Pigs move into major drainages in the summer months where rooting continues in damp soil. Hogs disperse through oak woodlands when acorns ripen and water is available in the fall. Potential problems of hogs consuming domestic garbage, a source of supplemental protein, have been avoided by use of bear-proof trash cans. Pigs utilize the heavy chaparral as cover during all months of the year. Periods of daily activity are variable and seem to depend on temperature or other weather factors. The effect of rooting activity on native plants, birds, insects, aquatic resources, reptiles, mammals, and soil erosion is unknown. As the prescribed burn program is applied to more lands, an increase in the pig population is expected.

Current Actions and Results: The monument records pig sightings by location and date. Hunting of pigs in the monument is prohibited and no known predators are available to control the rapidly expanding population. Research at Great Smokies National Park indicates that there is no significant competition between the pigs and other mammals.

3. Alternative Actions and Likely Impacts:

A. No action - The lack of an effective feral pig control program would be contrary to Service policy. If the feral pig population increases and expands its rooting activities to all areas of the monument, there will most likely be adverse impacts on the thin soils and the native terrestrial and aquatic plants and animals. Population will increase until limited by the availability of food.

B. Allow public hunting - The pigs have now expanded into the High Peaks "core" area of the park which also receives over 150,000 visitors annually. Although hunting in these areas would conflict with other visitor activities, newly acquired lands on both sides of the monument were heavily hunted prior to NPS ownership; receive little, if any, public visitation, and could likely sustain such activity again. However, enforcement and control of such a program would be difficult since the ranger staff is small and the availability of California Fish and Game personnel is limited. In addition, California law allows the use of hunting dogs, which could result in the harassment of other wildlife both inside and outside such "hunting allowed" zones. Although such a program would be very popular locally, considerable opposition could be expected from regional and national wildlife, conservation, and park organizations.

C. Conduct a depredation program using rangers - The use of rangers to shoot feral pigs would help control population levels but would not eliminate all pigs nor keep them from spreading to all sections of the monument. The location and foraging habits of these pigs is not completely known. The use of rangers at this time would not be an efficient use of monument personnel and shooting would pose a threat to visitors. While local opposition could be expected, regional and national response would probably be positive.

D. Live trapping - There are a variety of trapping techniques, but research at Great Smokies National Park and elsewhere has proven that they are not, by themselves, effective. Research is needed regarding the location and foraging habits of the pigs in order to effectively locate traps. Once trapped, there is a problem of disposal. They could possibly be released to local ranchers who stock their property for sport hunting. However, given time, many of the trapped pigs and new ones would return to the monument.

E. Re-introduction of natural predators. - The only native predators likely to prey on pigs are the mountain lion and wolf. Bobcat and coyote are believed to prey on young only. Although the monument already supports mountain lion, bobcat, and coyote, reintroduction of the wolf would be impractical due to Pinnacle's small size and the probability of opposition from local ranching interests. Regardless, such an action would only help control pig population levels; it would not control their distribution or eliminate the problem entirely. The natural resources of the monument would continue to be adversely affected.

F. Poisoning - Monument personnel could set out poison to control the pig population, but such an action would not eliminate the pigs from the entire monument, restrict their movement within the monument, nor keep other pigs from entering the monument from adjacent lands. Since there is no species-specific poison available, native animals would also be adversely affected.

G. Conduct a population dynamics study - Information is needed regarding the number and distribution of pigs within the monument and their interrelationship with native plants, insects, aquatic flora and fauna, other mammals, birds, and reptiles. This research will also identify the extent that pigs are damaging these and other resources of the monument.

H. Fence water sources - Build fences around water sources to exclude pigs during critical summer months. Such fencing would serve to discourage pig use during late summer and fall. Fences would be designed to allow other animals to reach the water but would keep pigs out. Water is available at only a few points within the monument during late summer and fall. Water holes and springs are probably the best points to set traps and/or observe hogs, should either be deemed necessary.

4. Recommended Action: The NPS' Cooperative Park Studies Unit, University of California at Davis, will conduct a research project on the numbers, population dynamics, and impacts of feral pigs in the monument starting in 1983. The project will collect and analyze information as recommended in the project statements for the following subjects: native plants (N-1), endangered species (N-5), mammals (N-4), aquatic flora and fauna (N-3), and insects (N-2). In addition, similar information will be collected and analyzed for birds and soils. This information will provide management with a sufficient data base to select and implement the most effective and efficient feral pig control program. Pig-proof fencing will be completed around the boundry to keep pigs outside the boundary from entering the monument, which they do freely now with nothing restricting their movements.

NATURAL RESOURCE PROJECT STATEMENT

1. PINN-N-9-FIRE ECOLOGY MONITORING

2. Statement of Problem or Issue: Pinnacles has developed burning prescriptions for a variety of vegetative types found in the monument. This was completed under N-6. These prescriptions were designed to be as broad as possible. They encompass a wide range of weather conditions and occur throughout the year. There is a correspondingly broad range of vegetative response on burns conducted using these prescriptions. The next logical step in the burn program is to find the range within the prescriptions which favors reproduction by native chaparral species and discourages invasion by exotic annuals. Fire response of the less common Pinnacles chaparral components, manzanitas, for example, has not been recorded.

3. Current Actions and Results: Post burn sampling is underway on selected burns. A vegetative map will be completed in 1983 by the Remote Sensing Division of the Denver Service Center. The NPS Cooperative Park Studies Unit, University of California, Davis, is compiling base data on vegetation as part of the feral pig research project that includes establishment of permanent transects.

4. Alternative Actions and Likely Impacts:

   A. No action - Continue to burn in all parts of the monument under broad prescriptions. This alternative will reduce fire hazard, but may not reporduce natural species composition in chaparral communities.

   B. Intensity sampling: - Continue to take full advantage of broad prescriptions around developed areas where risks to life and property are high. Start intensive pre and post burn sampling on all future burns. Tie fire effects to timing, community type, intensity and duration. Include monitoring plan in Fire Management Plan.

4. Recommended Action: Continue pre and post burn sampling on future burns. Include monitoring plan in Fire Management Plan. Sample vegetation on past burns. Continue to compile and record fire behavior information. This data will provide a strong data base for analysis by Resources Management Specialist.

C. Water Resources Management Program

1. Overview and Needs:

The monument lies within the Chalone Creek watershed. Waters within this watershed originate both inside and outside the monument from runoff and from natural springs, nine of which exist inside monument boundaries. Streams are intermittent, with heaviest surface flows occurring during the rainy season between November and April.

A major tributary of Chalone Creek was dammed during the 1930's by the Civilian Conservation Corps. In recent years (1976-1982), the dam has been determined to be structurally sound by the U.S. Army Corps of Engineers, the cement facing of the dam has been veneered with natural rock, and the water control valve has been repaired. Bear Gulch Reservoir behind the dam is subject to eutrophication and is used only by wildlife and an occasional visitor who disregards warnings about the potential health hazards of swimming.

Ground water exists in the alluvial material of the major drainages on a year-round basis. The well that serves the Headquarters area taps this saturated alluvion near the old Chalone Creek Campground. The present well for the west side of the monument is an artesian well that flows freely at the surface under static conditions.

While a basic hydrologic survey of the monument has been completed, two major projects need to also be developed. One is a study to determine the 100-year floodplain for four miles of Chalone Creek and its major tributary in Bear Valley (WR-2). The U.S. Geological Survey has already initiated this study which should be completed in FY 1983. Once completed, the monument will be able to implement its development plans for those two areas without being in conflict with Executive Order 11988 (Floodplains and Wetlands). The information will allow the NPS to ensure that property and visitors will continue to be protected from floods.

The second project is the development of a water resources management plan (WR-1). The plan will include the identification of water resources oriented management objectives, the classification of all surface water sources by present and proposed uses, a detailed plan for monitoring the quality of the monument's water, and the identification of water resources research needs. The plan will provide management with the data to adequately manage the monument's water resources and bring the monument into compliance with legislative requirements and Service policy.

2. Water Resources Management Project Statements

Following is a summary list, including current status, of the two major water resources management projects for Pinnacles National Monument. Detailed project statements for each can be found on the pages to follow.

Project No	Project Title	Status	Date Final Proposed
WR-1	Water Resources Management Plan (formerly N-7)	Proposed	1981
WR-2	Chalone Creek-Bear Creek Floodplain Study	Proposed	

WATER RESOURCE PROJECT STATEMENT

1. PINN-WR-1-WATER RESOURCES MANAGEMENT PLAN

2. Statement of Problem or Issue: Public Law 92-500 (Federal Water Pollution Control Act) and Public Law 95-217 (Clean Water Act of 1977), as well as Service policy requires that each park develop a water resources management plan. Pinnacles does not have such a plan and lacks the research data necessary to draft one.

   Current Actions and Results: An overview of the monument's hydrology is presented in the "Description of the Environment" section of this plan. The public water supply is monitored for bacteria and other contaminants and maintained at levels prescribed by the Environmental Protection Agency and the State of California. Although E. coli, or equivalents, have been recorded at 735-16,000 ppm in the monument's surface waters, no monitoring of those waters is currently being conducted. Visitors are continually warned of potential health hazards of swimming in the Bear Gulch reservoir, but often ignore such warnings.

   Nine surface springs have been identified in the monument, but more are believed to exist. Spring run-off and soil percolation rates have not been determined. No information is available concerning the rate of eutrophication of the Bear Gulch reservoir. Annual rainfall is closely monitored and recorded near the Bear Gulch and Chaparral Ranger Stations.

3. Alternative Actions and Likely Impacts:

   A. No action - Changes occurring in the natural hydrobiological processes within the monument could have detrimental effects on humans and wildlife, both in and outside the monument. Non-compliance with PL 92-500 and PL 95-217 could result in legal actions against the Service.

   B. Only react to emergencies, such as wildlife die-offs - The monument will manage its water resources on a piece-meal basis. Undetected surface water contamination levels could result in serious threats to the health of the visiting public and monument personnel. Furthermore, the park would still be in violation of the above laws.

   C. Conduct research necessary to develop a comprehensive water resources plan. - This would provide management with the data needed to adequately manage the monument's water resources and would bring the park into compliance with legislative requirements and Service policy.

4. Recommended Action: Develop a Water Resources Management Plan for the monument. This plan should include: identification of research needs, management objectives, classification of all surface water sources by present and proposed uses, a detailed plan for monitoring the quality of park's water that will reveal existing water quality and significant trends, and identify floodplains within the park.

WATER RESOURCE PROJECT STATEMENT

1. PINN-WR-2-CHALONE CREEK-BEAR CREEK FLOODPLAIN STUDY

2. Statement of Problem or Issue: A development plan for the east side of the monument has been developed. This plan identifies future development programs for the Chalone Creek and Bear Creek drainages. However, Executive Order 11988 (Floodplains and Wetlands) requires that a floodplain hazard study be conducted prior to additional development in the monument.

   Current Actions and Results: A study is underway by the U.S. Geological Survey to define the 100-year flood-plain along Bear and Chalone Creeks from the east boundary to the north end of the Chalone Creek annex. Approximately four miles of stream will be included in the study.

3. Alternative Actions and Likely Impacts:

   A. No action - Should the current study of the 100-year flood plain on the east side of the monument not be completed, the monument will not be able to implement its long-range development plans for Bear Creek and Chalone Creek drainages. Existing facilities will have to be considered sufficient for management, administrative, and visitor use purposes.

   B. Complete the floodplain study - The U.S. Geological Survey will complete the 100-year floodplain study for the east side. The monument will then be able to implement its long-range development plans for the Bear Creek and Chalone Creek areas, while being in compliance with Executive Order 11988. Completion of the study and implementation of the development plans will have some local impacts on the vegetation and wildlife, but detailed inventories of such resources prior to any development will minimize such impacts. The floodplain study will help the monument avoid losses due to flooding.

4. Recommended Action: The U.S. Geological Survey will complete its study of the 100-year floodplain. Information from this study will guide monument development and management actions and help protect monument property and the visiting public.

D. Cultural Resources Management Program

1. Overview and Needs

Pinnacles National Monument has 26 known archeological sites, 5 known historic sites, and 13 historic structures within its boundaries. A few artifacts have been collected, but no excavations or surveys have yet been initiated. Not all collected artifacts are stored in accordance with NPS standards. Lack of staff expertise in the care and handling of specimens has precluded their use in interpretive activities. Should additional artifacts be collected, there will be insufficient storage capacity at the monument.

Historic structures have been stabilized and, in some instances, undergone interior redesign for monument use. Homestead sites have not been surveyed as to artifact quantity or quality. They, like the archeological sites, have been subject to illegal collection activities in the past.

The archeologic and historic sites and the artifacts and data that they contain will be permanently lost unless the monument accelerates its survey and protection activities. Artifacts will be collected from known and newly discovered archeologic sites (C-1 and C-3), survey known historic sites and remove all artifacts of value (C-2), excavate several accessible archeologic sites and collect all artifacts found (C-1), survey additional areas of the monument following prescribed burns (C-1), adequately store items necessary for interpretive activities in the monument (C-3), send all archeologic and historic artifacts not to be retained for interpretive purposes to the GOGA repository or the Southwest Archeological Center (C-1 and C-3), and develop interpretive displays about the history of the monument at Willow Springs and at a site at the west boundary (C-2).

These actions will provide the monument with sufficient information to develop, manage and protect the resources of the monument without inadvertently destroying an important archeological or historic site, artifact, or document. Minor site disturbance will occur during the collection of surface artifacts, and short term serious disturbances will occur when sites are excavated. Interpretive devices, such as plaques, will be visually obtrusive to the historic scene, but the size of the park staff makes personal interpretation impractical.

2. Following is a summary list, including current status, of three major archeologic and historic projects for Pinnacles National Monument. Detailed project statements for each can be found on the pages to follow.

Project No	Project Title	Status	Date Final Proposed
C-1	Archeological Site Protection	In Progress	1981
C-2	Historic Site Protection	In Progress	1981
C-3	Artifact Collection & Preservation	Proposed	1981

CULTURAL RESOURCE PROJECT STATEMENT

1. PINN-C-1-ARCHEOLOGIC RESOURCE PRESERVATION

2. Statement of Problem or Issue: Pinnacles has been nominated for archeological district status due to the significant number of sites located within its boundaries. Surveys have concentrated on developed and easily accessible areas. Large areas of the park have not been surveyed. The surface artifacts collected from known sites are not in NPS hands. No sites have been excavated. Several sites were damaged during development of visitor and management facilities.

   Current Actions and Results: An initial archeological survey conducted in 1966 by Olsen, et al, concentrated in the major drainages in and around the developed areas of the park. Thirteen sites were located and about 3 dozen surface artifacts were collected and deposited with the California Department of Parks and Recreation in Sacramento. These artifacts were returned to Pinnacles National Monument in 1982 after a grat deal of "tracking" as they were missing from the depository in Sacramento. These artifacts are now accessioned and stored according to NPS standards. A second survey, conducted in 1980, examined newly purchased lands and areas targeted for development in the monument development plan. Although 13 more sites were located, their locations have not been publicized and the monument has been unable to program resources or human impacts. A few surface artifacts from these newly discovered sites have been collected by park staff, but have not been accessioned and are not properly stored. Ongoing prescribed burns may be burning over unknown sites.

   Areas proposed for development in the foreseeable future have been examined for archeological sites. It is believed that the majority of the archeological sites in these areas have been located, although minor sites may remain unknown since surveys concentrated only on "likely locations." There are no additional survey plans for other areas of the park, despite the likelihood that the prescribed burn program may expose new sites. The burn program may damage unknown sites but since fire has swept over the area for centuries, it is unlikely that the prescribed burn program will cause significant damage to those sites. The development of north and south wilderness trails will make several sites more accessible to accidental or deliberate visitor use and will result in site degradation and loss of surface artifacts. Most of what is known about local native culture is based on conjecture and parallels from adjacent cultures. Failure to excavate promising sites contributes to this lack of knowledge and hampers interpretive efforts.

3. Alternative Actions and Likely Impacts:

   A. No further action - The large number of sites already located suggests that many more remain to be found. No further action will result in the loss of knowledge and/or artifacts by natural forces or to "pot hunters." Future management activities may inadvertently damage or destroy hitherto unknown sites.

B. Recover surface artifacts from known sites - This will require assistance from the Regional Archeologist since no one on the park staff has the skill to determine what or how artifacts should be collected. This action will result in preservation of known artifacts without further loss to nature or man, and should require little, if any, site disturbance. Storage capacity at Pinnacles is severely limited; any collected artifacts should be stored at the Golden Gate NRA respository or the Southwest Archeological Center.

C. Completely survey entire park - This will be extremely expensive and time consuming. Large portions of the park are inaccessible due to dense chaparrel. Such a survey will greatly increase the cultural data base available to management for resource management decisions.

D. Excavate sites - Several sites have excavation potential and have been recommended for such action. Excavation could provide management with considerable data concerning the historic vegetative cover of the area; this information is of prime importance to the fire management program and is currently not available from other authoritative sources. It is possible that new knowledge could be gained concerning the Ohlones and their way of life, thus enhancing the monument's interpretive program. Excavation would call public attention to the sites at Pinnacles and could result in increased site protection problems.

E. Selectively survey following prescribed burns - As significant areas of the park are "opened" due to fire, trail development, natural catastrophe, etc., they could be surveyed for potential sites. This would minimize manpower and time requirements for actual survey, although start up times would be increased due to the multiple surveys. It is likely that many areas of the park would never be surveyed under this alternative; however these would generally be the less accessible areas which have low potential for archeological sites. Such sites could experience loss or degradation through weathering and inadvertent management actions, since it would be several years before the bulk of the park would be surveyed. A cycle of approximately every five years would be anticipated.

F. Selectively survey prior to prescribed burns - Each prescribed burn site will be surveyed prior to burning. This will provide maximum protection from burning and inadvertent destruction by fire-fighters for unknown sites. However, the burning program is a year-round activity, where and when a burn will be conducted is highly dependent on a daily weather and local conditions. This alternative would severely limit such required flexibility. Furthermore, most areas selected for burning are so dense with over mature chaparral that surveys would be physically impossible.

4. Recommended Action: In order to gather sufficient evidence and knowledge of human habitation in the Pinnacles, and in order to adequately protect known archeological resources, the following actions are recommended: (a) the Regional Archeologist will assist the monument collect artifacts from

known and newly discovered archeological sites; (b) collected artifacts will be stored at the GOGA respository or the Southwest Archeological Center; (c) excavate several accessible sites; and (d) survey additional areas of the monument after such areas have been burned under the fire management plan.

5. Update FY 1983: Artifacts currently stored with the state were returned to NPS in early FY 1983.

CULTURAL RESOURCE PROJECT STATEMENT

1. PINN-C-2-PINNACLES HISTORIC SITE PROTECTION

2. Statement of Problem or Issue: Pinnacles has five known historic sites which represent 19th and 20th Century attempts by Europeans to settle the area. Two of these sites are located within 30 meters of the new North Wilderness Trail and will be subjected to vandalism. A third is located in the chaparral developed area and is subjected to deliberate and accidental abuse. Another is located within a meter of the west boundary and could be damaged through deliberate or accidental trespass by visitors and livestock. None of the sites have been excavated and all contain unknown quantities of surface and sub-surface artifacts.

   In addition, Pinnacles has 13 structures on the historic structures list. These structures are in use at this time and are subject to vandalism, natural deterioration, and wear and tear caused by their adaptive use.

   Current Actions and Results: The North Wilderness Trail was routed to prevent accidental site damage. All historic structures have been nominated to the National Register of Historic Places and are on a cyclic maintenance program. Homestead site locations are mapped, but are not made known to visitors.

   Historic structures have been stabilized and, in some cases, undergone interior redesign. Homestead sites have not been surveyed as to artifact quality or quantity, and current staff size is insufficient to prevent theft of surface artifacts. As access is improved via trails and due to precribed burns, adverse visitor impact is expected to increase.

3. Alternative Actions and Likely Impacts:

   A. No further action - Without cyclic maintenance, historic structures will rapidly deteriorate and eventually require the construction of new facilities to house current park operations. Homestead sites will continue to deteriorate through natural and human impact. The loss of surface artifacts will continue.

   B. Continue adaptive use of historic structures - Although cyclic maintenance costs are high, capital construction costs of new facilities would be even higher. These buildings provide necessary operating space and, made of native rock, blend into the park's scenic fabric.

   C. Fence historic sites - This would require a considerable expenditure of manpower and money and would be relatively ineffective due to the remote nature of most of the sites. Furthermore, fencing would only draw more attention to the sites and likely result in increased theft and vandalism.

D. Survey sites and develop for interpretation - Each site will be surveyed for surface and subsurface artifacts. Those items deemed of value will be removed, catalogued, and stored. Those items not worth preserving will be incorporated into unmanned interpretive displays. The two sites at Willow Spring and the site at the west boundary are the least disturbed and will make excellent interpretive stations. Should the sites be publicized, however, some degree of degradation will occur, regardless of stabilization or protection techniques employed.

4. Recommended Action: Continue adaptive use and cyclic maintenance of historic structures. Survey known sites and remove all artifacts of value. Develop west boundary and Willow Spring sites for interpretive purposes.

CULTURAL RESOURCE PROJECT STATEMENT

1. PINN-C-3-ARTIFACT COLLECTION AND PRESERVATION

2. Statement of Problem or Issue: Pinnacles has a variety of sites which have been identified as having archeologic or historic value. All sites contain surface artifacts and likely contain subsurface artifacts. While, a limited number of these items have been retrieved, there will be insufficient storage capacity should all items be collected. In addition, collected items are deteriorating due to lack of staff expertise.

   Current Actions and Results: Twenty-six stone artifacts have been collected and are currently accessioned and stored at Pinnacles. A small number of other archeologic and historic items are at the park but are improperly stored. Fragile historic items such as photographic negatives are subjected to temperature extremes and non-acid free envelopes. Park museum records are not in compliance with Service standards. Lack of staff expertise in the care and handling of speciments has precluded their use in interpretive activities. Some items are catalogued and the records have been forwarded to Harper's Ferry. Exposed artifacts continue to deteriorate and are subject to theft.

3. Alternative Actions and Likely Impacts:

   A. No further action - Surface and sub-surface artifacts will continue to deteriorate through natural processes, or be stolen. Artifacts in NPS hands at Pinnacles may be permanently damaged or lost due to improper storage. Park interpretation of events represented by these artifacts will be hampered.

   B. Excavate all known sites - While this would provide a tremendous volume of items, it is likely that many artifacts of significance would be located. Storage of a large number of items would be difficult. The sites would be irrevokably damaged, contrary to current Service policy.

   C. Recover all surface items - This would result in less site damage but would still generate large quantities of artifacts, most with little or no significant value. Storage of a large number of items would be difficult. Cultural interpretation would be improved.

   D. Selectively recover surface items - Under the guidance of the Regional Curator/Archeologist, those surface items deemed to be of value would be collected and treated as needed. Items necessary for park interpretation would be left at the park; the rest would be kept at the Southwest Archeological Center or at the Golden Gate NRA repository. Only the excavation recommended in C-1 (Archeologic Resource Protection) would be conducted.

4. Recommended Action: Alternative D is recommended. Also, park records should be updated to the new format. Items kept at the park should be properly stored.

IV. ENVIRONMENTAL ASSESSMENT

Matrix Displays

The Natural and Cultural Resources Management Plan for Pinnacles National Monument summarizes the geological and ecological resources of the area, indicates the Congressional mandates and State requirements under which the National Park Service must manage the area, and sets forth a five-year plan to meet those mandates and requirements. The impact matrix sheets outline the environmental impacts resulting from resources management actions recommended in the plan. Details of these impacts can also be found in the project narrative and Project Statements sections of this document. Projects whose titles are followed by an asterisk (*) are those that were included in the 1976 Natural Resources Management Plan and Environmental Assessment and have been either completed or eliminated from further consideration; these projects have undergone previous public review. The matrix sheets for new projects present environmental impacts for both the proposed actions and alternatives to these actions.

Matrix sheets for individual projects follow:

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: FIRE PROTECTION AGREEMENTS, RM-1
NEED FOR THE PROPOSAL: The park is agressively conducting a prescribed burn program (RM-2) and an escape is always possible; agreements need to be in place to allow for control of such an escape. Adjacent agencies are also conducting such a program and logical burn zones often cross agency boundaries, making joint burns desirable. Wildfires cross agency boundaries. Cooperative preplanning increases efficiency and reduces delay and confusion over differing resources management objectives.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Develop mutual aid agreement w/BLM & USFS; maintain agreement w/CDF.	ALTERNATIVE No action.	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
AESTHETICS	Temporary increases in smoke could reduce vistas; will reduce scars due to suppression action.	None			
VISITOR USE	Larger burn operations could result in certain areas being temporarily closed until burning is completed.	None			
AIR QUALITY	Joint operations could result in larger burns and greater short term volume of particulate matter becoming airborn.	None			
BURN PROGRAM RM-2	Will allow larger, more natural fires to occur.	Mutual fire suppression efforts with CDF, BLM and USFS will delayed; training will be duplicated.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: PRESCRIBED BURN PROGRAM, RM-2

NEED FOR THE PROPOSAL: Fire has been suppressed at Pinnacles for 70 years. This has resulted in uniformly mature vegetative cover. Changes in timing and frequency of fires due to human ignition patterns and fire suppression have altered natural fire cycles. High fuel loads in some types increase resistance to control.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Continue prescribed burn program at accelerated rate using fire return intervals appropriate in each community.	ALTERNATIVE No action.	ALTERNATIVE Conduct fire management program under CDF or BLM.	ALTERNATIVE Continue with Spring-Late Fall Pattern.	ALTERNATIVE Establish a Let Burn Policy -All Ignitions.
VEGETATION	Short-term destruction of some live cover, and reduction of fire intolerant species; reduction of fuel load.	Chaparral community will continue in its ubiquitously mature state.	Short-term destruction of some vegetation; program would not meet goal of 1000 acres per year.	Not consistent with Area's fire history; north slopes would not be successfully treated. Fails to reproduce natural species composition	Does not duplicate natural frequency or timing.
WILDLIFE	Some destruction of species unable to flee, but not enough to harm population vigor; temporary displacement of other species; long term increase in availability of forage.	Composition and diversity of wildlife will be reduced.	Impacts similar to proposed action impacts, but on a more limited scale.	Impacts similar to proposed action impacts, but on a more limited scale.	Impacts similar to proposed action impacts, but on a more scale.
AIR QUALITY	Short term decrease during periods of ignition, no long term decrease.	Air quality will not be adversely impacted.	Impacts similar to proposed action impacts, but on a more limited scale.	Impacts similar to proposed action impacts, but on a more limited scale.	Impacts similar to proposed action impacts, but on a more limited scale.
AESTHETICS	Temporary reduction of vistas due to smoke; long term improvement due to younger	Reduction in burn acreage on a yearly basis. Large acreage	Impacts similar to proposed action impacts, but on a more limited	Impacts similar to proposed action impacts, but on a more limited	Impacts similar to proposed action impacts, but on a more limited

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: PRESCRIBED BURN PROGRAM, RM-2 (continued)

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Continue prescribed burn program at accelerated rate using fire return intervals appropriate in each community.	ALTERNATIVE No action.	ALTERNATIVE Conduct fire management program under CDF or BLM.	ALTERNATIVE Continue with Spring-Late Fall Pattern.	ALTERNATIVE Establish a Let Burn Policy -All Ignitions.
VISITOR USE	May be restricted in areas being burned. Will eventually open more areas to visitors use where now impossible.	No restrictions for visitors; increased safety hazard due to fire loads.	Impacts similar to proposed action impacts, but on a more limited scale.	Same; represents lowest risk option.	Not consistent with NPS responsibilities to protect government facilities, the public and park neighbors.
CULTURAL RESOURCES	Unlikely to damage archeologic resources, but could damage homestead sites if they are allowed to burn.	Heavy fuel loads would threaten historic sites.	Same impacts as proposed action impacts.	Same impacts as proposed action impacts.	Would damage historic sites.

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: BALCONIES CAVE TRAIL IMPROVEMENT, RM-4
NEED FOR THE PROPOSAL: The current trail is poorly marked and visitors stray off trails causing erosion problems.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Upgrade hazardous portions of trail.	No action.	Install a paved trail.	Install lights throughout cave.	Close the cave.
AESTHETICS	Necessary tools and equipment at the work site may reduce visitor's experience.	No change.	Not compatible with wilderness area designation.	Not compatible with wilderness area designation.	Would require major alterations to cave openings to be enforceable.
VISITOR USE	Caves may be temporarily closed while work is in progress. Will eventually lead to greater visitor safety.	No improvement in visitor safety; continued visitor complaints.	Would reduce visitor injuries and complaints.	Would reduce visitor injuries and complaints.	Visitors would not be able to visit one of the monument's most important geologic features, would result in negative public reaction.

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: BEAR GULCH CAVES TRAIL IMPROVEMENT, RM-5
NEED FOR THE PROPOSAL: White arrows have been painted on the rocks in several places and often are confusing or misleading. Certain sections of the trail are below standard and are a safety hazard.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Upgrade trail to improve safety.	ALTERNATIVE No action.	ALTERNATIVE Close caves.	ALTERNATIVE	ALTERNATIVE
AESTHETICS	Necessary tools and equipment at the site may reduce the visitor's experience.	No change.	Necessary enforcement structures would mar the cave entrances.		
VISITOR USE	Caves may be temporarily closed while work is in progress; will eventually lead to greater visitor safety and enjoyment.	Visitors will continue to be exposed to hazardous trail conditions.	Visitors would be prevented from enjoying one of monument's major geologic features; would result in unfavorable public reaction.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: NORTH AREA WILDERNESS TRAIL, RM-8
NEED FOR THE PROPOSAL: There is no access into this portion of the wilderness. This has hampered patrols to combat poaching, illegal camping, and cattle trespass. Monument neighbors are scheduling burns adjacent to this area and NPS burns are also planned; without the trail there is no access for fire crews. The trail will also allow access to several historic and archeological sites for study and protection. The trail is 2/3 complete.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Complete trail.	No action.			
VEGETATION	Some vegetation along immediate route will be destroyed; increased access for fire program will result in healthier vegetative cover.	No immediate impact on vegetation; difficulty in implementing fire management plan due to inadequate access.			
CULTURAL RESOURCES	The route has been surveyed and the trail relocated to avoid all sites; some adverse impact on individual sites due to increased access.	Access to cultural resource sites would continue to be limited; survey and interpretation of such sites would be hindered.			
VISITOR USE	Increased enjoyment due to increased accessibility of wilderness and to cultural resources which will now be interpreted.	Visitor access to northern wilderness area would continue to be limited; visitors still will be faced with dead-end trail.			
AESTHETICS	Minor impact while temporary scars from construction	No change.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: NORTH AREA WILDERNESS TRAIL, RM-8 (continued)
NEED FOR THE PROPOSAL: There is no access into this portion of the wilderness. This has hampered patrols to combat poaching, illegal camping, and cattle trespass. Monument neighbors are scheduling burns adjacent to this area and NPS burns are also planned; without the trail there is no access for fire crews. The trail will also allow access to several historic and archeological sites for study and protection. The trail is 2/3 complete.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Complete trail.	No action.			
WILDLIFE	Temporary displacement during construction; visitor use should be light enough to cause no impact.	No change.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: BOUNDARY FENCING, RM-11
NEED FOR THE PROPOSAL: Enforcement of hunting regulations is difficult since the park's boundary is not plainly marked. Cattle trespass is a significant problem and results in fouled water holes, introduction of exotics and erosion. Feral hog movement cannot be restricted without fencing.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Fence entire park boundary.	ALTERNATIVE No action.	ALTERNATIVE Install drift fences only.	ALTERNATIVE	ALTERNATIVE
WILDLIFE	Short term displacement during construction; eliminate competition between cattle and native wildlife; eliminate competition from feral hogs.	Cattle, hunting and poaching will not be eliminated; continued competition between cattle and wildlife; will not exclude feral hogs.	Will not effectively prevent trespass by cattle and subsequently impact on wildlife; will not exclude feral hogs.		
AESTHETICS	Range fences are a normal part of the local landscape; impact will be minimal if at all.	No change.	No change.		
VISITOR USE	Will provide clear delineation of park boundary to hunters and trespass grazers; no impact on authorized visitor use.	Trespass hunters and poachers will not be reduced; no impact on authorized visitor use.	Trespass hunters and poachers will not be reduced; no impact on authorized visitor use.		
FIRE PROTECTION	May impede movement of men and equipment in fire operations.	No change.	No change.		
WATER RESOURCES	Should improve surface water quality since feral hogs and stock will not be able to reach water holes and	Continued degradation of surface water resources.	Will not exclude feral pigs or effectively prevent trespass by cattle and subsequent impact on water resources.		

MATRIX-DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: BOUNDARY FENCING, RM-11 (continued)

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Fence entire park boundary.	ALTERNATIVE No action.	ALTERNATIVE Install drift fence only.	ALTERNATIVE	ALTERNATIVE
VEGETATION	Will help control introduction of exotic plants by eliminating cattle; plants will be protected from cattle and feral hogs.	Cattle will introduce exotics and destroy some vegetation; feral hogs will continue resource damage.	Will not prevent trespass by cattle and subsequent destruction of plants and introduction of exotic plants; will not eliminate resource damage by feral hogs.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: BEECHY GROUND SQUIRREL CONTROL PROGRAM, RM-13
NEED FOR THE PROPOSAL: Due to the elimination of natural predators, and the unnatural food supply provided by park visitors, the ground squirrel population is well above the carrying capacity of the park. They burrow under buildings and extensively into hillsides, undermining both. They also serve as host to the plaque vector.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Continue controls with gas cartridges.	ALTERNATIVE No action.	ALTERNATIVE Complete eradication program with toxic pesticides.	ALTERNATIVE Use live trapping.	ALTERNATIVE Shooting.
WILDLIFE	Possible destruction of other wildlife occupying burrow when gas is applied. Reduced chances of disease transmitted to other animals.	Expansion of squirrel population's increased threat of plague.	Possible contamination of other species, control of squirrel population levels.	Displacement into other areas with subsequent competition with other squirrels.	Would be species specific; reduced chances of disease transmitted to other mammals if removed.
SOILS	Greater stabilization especially on steep slopes, as burrowing activity is reduced.	Increased soil erosion.	Same as impacts of proposed action.	Same as impacts of proposed action.	Same as impacts of proposed action.
AESTHETICS	Temporary impact due to large volume of smoke produced by burning cartridge.	Increased degradation of picnic areas and campgrounds.	Increased number of dead animals may be visible to public.	Live traps would be visible and objectionable to some visitors.	Visual and audio impacts would produce negative reaction from public.
AIR QUALITY	Temporary reduction in immediate vicinity of burrows due to sulfur carrier agent.	No air pollution.	No air pollution.	No air pollution.	No air pollution.
SAFETY	Reduced likelihood of plague transmission to humans.	Increased threat of plague.	Same as impacts of proposed action and of shooting squirrels.	Same as impacts of proposed action.	Visitors would be threatened if carcasses not removed, health risks would be increased.

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: WILDERNESS MANAGEMENT PROGRAM WITH BLM, RM-14
NEED FOR THE PROPOSAL: Pinnacles' boundaries do not reflect natural boundaries and frequently dissect natural ecosystems. Through joint management of adjacent BLM wilderness lands, this problem can largely be averted and public lands will be better protected and managed.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION: Joint BLM-NPS wilderness management program.	ALTERNATIVE: No action.	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
WILDLIFE	Improved control of exotic plants and feral animals on adjacent lands, and, subsequently, on monument lands.	Grazing and hunting activities on BLM land could further reduce available habitat for park wildlife.			
AESTHETICS	Possible control of future incompatible development on adjacent lands.	Imcompatible developments could occur on park boundary.			
WATER RESOURCES	Entire drainage can be managed as a single unit.	Incompatible uses could adversely impact water resources.			
BOUNDARY FENCING	Fencing would be along geographic lines, and accessible for repairs.	Cattle could become trapped in the narrow canyons; some sections would be almost impossible to fence due to terrain.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: DODDER CONTROL, RM-15
NEED FOR THE PROPOSAL: Dodder infestation is increasing at a rapid rate. It is destroying significant quantities of California buckwheat and may be attacking a rare subspecies, Pinnacles buckwheat.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Selective burning; continue research and monitoring.	No action.	Poison.	Pull by hand.	
VEGETATION	Localized damage of approximately 1 year until new seeding of buckwheat occurs.	Likely lead to destruction of native buckwheat population.	Other species would be destroyed also since there is no species specific poison.	Technique would not destroy the dodder seed already on the ground.	
AESTHETICS	Localized short-term elimination of vegetative cover.	Visitors enjoy the bright orange filiments against the dark red/brown buckwheat.	Large patches of dead plants would detract from the visitor's experience.	Would have no impact on aesthetics.	
AIR QUALITY	This would be part of the overall park burning program and would result in no additional air quality decrease.	Would eliminate short-term air quality degradation due to burn program.	No impact.	No impact.	
WILDLIFE	Same impact as prescribed burn project (RM-2).	Possible decline in any species which depend on buckwheat as a food source.	Some species would be affected.	No impact.	
MANPOWER	Labor efficient.	No manpower needed.	Labor efficient.	Extremely labor intensive and would exceed ability of park staff.	

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: SOUTH WILDERNESS TRAIL, RM-16
NEED FOR THE PROPOSAL: There is currently no access into the southern 1/3 of the park, for fire programs, to prevent cattle trespass, patrols, or other management needs. Further, this large protion of the park is inaccessible to park visitors.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Complete trail from S. Chalone Peak through Section 13.	ALTERNATIVE No action.	ALTERNATIVE Trail from S. Chalone Peak along flank of Mt. Defiance.	ALTERNATIVE	ALTERNATIVE
VEGETATION	Minor damage along immediate trail route for 1-2 years.	No immediate impact on vegetation; difficulty in implementing fire management program due to limited access.	Minor damage along immediate trail route for 1-2 years.		
SOILS	Some soil erosion due to construction, but stabilization efforts will be part of project.	No change.	Extremely steep terrain and shallow soil would accelerate erosion.		
WILDLIFE	Temporary displacement during construction.	No change.	Temporary displacement during construction.		
AESTHETICS	Trail will be visible from most vantage points along east boundary.	No change.	Trail will be visible from most vantage points along east boundary.		
VISITOR USE	Increased visitor use of back country	Visitors will be excluded from 1/3 of the park's wilderness area.	Slightly increased visitor use of back country.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: AIR QUALITY MONITORING, RM-17
NEED FOR THE PROPOSAL: Most of Pinnacles is a Class I air quality area, however, there is no program to monitor the status of air quality in the park. As "urban/suburban sprawl" continues in the Santa Clara, Salinas, Hollister areas, overall air quality of the region is likely to deteriorate.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Establish in-park monitoring program.	ALTERNATIVE No action.	ALTERNATIVE Use stations outside the park.	ALTERNATIVE Visual observations only.	ALTERNATIVE
VEGETATION	Localized damage at site of monitoring stations due to station construction.	Probable damage to indicator species before management is aware of problem.	Data will not be specific enough to protect park populations.	Reactive only; unable to detect noxious gases before damage occurs.	
AESTHETICS	Visual intrusion of monitoring equipment.	No local data will be available for developing future action plans.	Would not reflect localized air deterioration during high visitation periods.	Data collected would be subject to personal conclusion rather than objective facts.	

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: MISTLETOE MONITORING PROGRAM, RM-18
NEED FOR THE PROPOSAL: Mistletoe has currently infested a plantation of digger pines in the headquarters area. So far, only a few natives have also been infected. A program is needed to monitor the progress of the infestation and to develop a counter measure should natives become threatened.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Monitor infested areas.	ALTERNATIVE No action.	ALTERNATIVE Eradication program.	ALTERNATIVE	ALTERNATIVE
VEGETATION	Diggers may be weakened sufficiently to host other parasites and diseases; spread of the mistletoe will be noticed.	Mistletoe will continue to spread, possibly to natives, without notice.	Infected trees will likely be destroyed in the process.		
AESTHETICS	Visitors may find the deformed crowns intriguing.	Visitors may find the deformed crowns intriguing.	The damaged/dead hosts will be unsightly.		
INTERPRETATION	Excellent opportunity to interpret the parasitic relationship and the effects on natural populations vs plantations.	Opportunity to interpret parasitic relationships and the effects on natural vs plantation populations.	Opportunity to interpret resources management action.		
WILDLIFE	No impact.	Could eventually lead to loss of digger pine population and damage those species dependent on the nuts.	Possible species damage depending on eradication method.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: TRAIL STABILIZATION AND MAINTENANCE, RM-19
NEED FOR THE PROPOSAL: Many trails are suffering from advanced erosion and deterioration, to the point of causing resource damage.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Repair and stabilize current damage-cyclic maintenance to prevent further damage.	No action.	Close damaged trails.	Cyclic maintenance only-no stabilization.	
VISITOR USE	Trails may be temporarily closed during repairs.	Visitor safety risk will continue to mount.	Visitor enjoyment will be significantly reduced.	Visitor safety risks will continue to be high.	
AESTHETICS	Temporary loss during any major reconstruction activity.	Deteriorated trails will reduce the visitor's experience.	Deteriorating trails will continue to be an eyesore from all vantage points.	Some visual deterioration as soil stabilizes.	
SOILS	Erosion rates will be slowed.	Erosion rates and soil deterioration will accelerate.	Erosion rates and soil deterioration will accelerate.	Erosion rates will decline but soil deterioration will continue.	

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: IMPACT OF CLIMBERS ON RESOURCES, RM-20
NEED FOR THE PROPOSAL: The impact of climbers on the rock walls, native vegetation, and erosion levels is quite visible. Before a program to minimize such impacts can be developed, information about visitor activities, numbers, and impacts is needed.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Establish a resource monitoring program and climbers education program.	No action.			
VEGETATION	Would determine impacts on vegetation; no immediate impact.	Continued degradation of vegetation.			
VISITOR USE	Voluntary registration would be slight inconvenience to climbers; otherwise no change in visitor use.	No change.			
ROCK FORMATIONS	Damage to rocks would be reduced.	Damage to rocks would continue.			

PROJECT STATEMENT TITLE: OAK REPRODUCTION MONITORING, RM-21
NEED FOR THE PROPOSAL: Lack of reproductive success is a recognized but little understood problem in deciduous oak stands. No evaluation of the age class structure of blue or valley oaks has been conducted at Pinnacles.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Monitor oak stands.	ALTERNATIVE No action.	ALTERNATIVE Delay action.	ALTERNATIVE	ALTERNATIVE
VEGETATION	No impact on health of stand; can base management action on data; take action to insure reproduction if none is occurring.	Trees could eventually be lost.	Corrective action delayed because of lack of data.		
WILDLIFE	No impact from study; retain habitat.	Food and habitat could eventually be lost.	Same as proposed action, but delayed.		
AESTHETICS	No impact from study; insure scenic diversity in future; retention of unique ecosystem assured.	Diversity and scenic woodland could be lost.	Same as proposed action, but delayed.		
VISITOR USE	Insure retention of California oak woodland; provide interpretation of ecosystem.	Loss of opportunity to visit valley oak woodland is possible.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: PLANT INVENTORY, N-1

NEED FOR THE PROPOSAL: A partial inventory has been conducted, but a complete one is needed in order to prevent accidental adverse affects on the park's flora due to the prescribed burn program and to access effect of feral hogs on monument flora.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Conduct complete flora inventory and vegetation map.	ALTERNATIVE No action.	ALTERNATIVE Continue VIP identification and cataloging program.	ALTERNATIVE	ALTERNATIVE
VEGETATION	Some minor destruction as samples are collected.	Monument will not have inventory of plants, nor know their distribution or significance.	Significant members of species will be missed, the distribution of species and communities will be unknown.		
WILDLIFE	May be temporary displacement during collecting activities; determine effect of feral hogs on flora.	Management action could inadvertently destroy wildlife due to interrelationship with plants.	Management action could inadvertently destroy wildlife due to interrelationship with plants.		
FIRE PROGRAM	Will insure that rare endangered species are not accidentally burned.	Impact of fire program will not be adequately assessed.	Impact of fire program will not be adequately assessed.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: ENTOMOLOGICAL INVENTORY, N-2
NEED FOR THE PROPOSAL: A partial collection has been compiled, but there is not a complete inventory of the park's entomological resources. Without this, management actions could accidentally affect various insect populations adversely. Need to access interrelationships of feral hogs and insects.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Make complete entomological inventory.	No action.	Continue to have personnel add to Insect List.		
WILDLIFE	May be some temporary displacement during collection activities; some insects will be killed in the collection process.	Inadequate knowledge of insect population which would be adversely affected by other management actions.	Inadequate knowledge of insect population, which would be adversely affected by other management actions.		
AESTHETICS	Some visitors may object to seeing collection traps in a "natural" setting.	No change.	No change.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: LIMNOLOGICAL INVENTORY, N-3
NEED FOR THE PROPOSAL: There has been no inventory of the park's limnological resources. Management actions may be adversely affecting fresh water flora and fauna without this research.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Conduct complete limnological inventory.	No action.			
AQUATIC WILDLIFE	Some destruction or displacement may occur depending on survey techniques. Rare and endangered species will be identified and protected.	Inadequate knowledge of aquatic resources could result in their inadvertent destruction by other management actions.			
AQUATIC FLORA	Some individual plants will be destroyed in the study process. Rare/endangered species will be identified and protected.	Inadequate knowledge of aquatic resources could result in their inadvertent destruction by other management actions.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: MAMMAL INVENTORY, N-4
NEED FOR THE PROPOSAL: On-going program such as the prescribed burn program and the park development plan could be adversely affecting the mammal population, especially rare and/or endangered species. Accessment of competition between native wildlife and feral hogs essential.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Conduct complete mammal inventory.	No action.			
VISITOR USE	Some areas may have to be temporarily closed during survey.	No change.			
WILDLIFE	Some displacement occurrence during survey; management of all species will improve; rare and endangered species will be identified and protected; access impact of exotic species.	Rare or endangered species could become extinct without management's knowledge; other species could reach problem proportions before control programs could be implemented; feral animals could become established.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: ENDANGERED SPECIES STUDY, N-5

NEED FOR THE PROPOSAL: The presence of endangered species needs to be established in order to provide for their protection and habitat preservation. Currently, Pinnacles is known to support at least the Peregrine Falcon, and may have several other rare/endangered species.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Parkwide inventory to determine rare and/or endangered species.	No action.	Perform localized inventories in known impact areas.	Partial survey.	
WILDLIFE/PLANTS	Rare and/or endangered species will be identified and program developed to protect them.	Endangered species will continue to be threatened.	Provide limited protection, but fails to recognize seasonal movement of species and consequences of disturbance of adjacent areas.	Provide limited protection, but fails to recognize seasonal movement of species and consequences of disturbance of adjacent areas.	
VISITOR USE	Some areas may have to be temporarily or permanently closed.	No change.	Same as impact on proposed action.	Same as impact on proposed action.	
DEVELOPMENT PLANS	Current East and West side development programs may have to be altered.	No change.	Delays in development plans may occur late in planning programs.	Same as impact of proposed action.	

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: FERAL PIG RESEARCH PROGRAM, N-8
NEED FOR THE PROPOSAL: Feral pigs are increasing in population and range within the park. The effects of this on native flora and fauna is unknown, but believed to be adverse.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
	Study effects of feral pig infusion.	No action.	Allow public hunting.	Depradation using rangers.	Live Trapping.
WILDLIFE	Some native species may be accidentally trapped.	Pigs may compete with native species for available food.	Other species are likely to be killed also.	No impact.	Other species are likely to be caught also.
PUBLIC RELATIONS	No impact.	Visiting public may eventually object to pig-related damage.	Likely adverse reaction from conservationist groups.	Local and regional hunting groups will object.	Legal disposal of trapped pigs will be extremely difficult and controversial.
AESTHETICS	Some visitors may view traps and pens as eyesores.	Large areas of rooting will be unsightly.	Noise from shooting would be objectionable to some visitors.	Noise from shooting would be objectional to some visitors.	Visual impact of live traps would be objectionable to some visitors.
VEGETATION	No immediate impacts; could eventually benefit vegetation if study leads to elimination of pigs.	Rooting activity may eliminate some native species.	Hunters will likely leave established trails and cause considerable damage to vegetation.	As pigs are eliminated, vegetation would not be so severely impacted.	As pigs are eliminated, vegetation would not be so severely impacted.
VISITOR USE	Some areas may be temporarily closed to public use.	Visitors enjoy viewing feral pigs.	Areas opened to hunting would have to be closed to public use.	Areas opened to depradation would be closed to public use.	Visitor use in areas may have to be restricted.
WATER RESOURCES	No immediate impacts; could eventually benefit vegetation if study leads to	Pigs will continue to foul the major surface water sources within	As pigs are eliminated, water quality would be better	As pigs are eliminated, water quality would be better	As pigs are eliminated, water quality would be better

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: FERAL PIG RESEARCH PROGRAM, N-8 (continued)
NEED FOR THE PROPOSAL: Feral pigs are increasing in population and range within the park. The effects of this on native flora and fauna is unknown, but believed to be adverse.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
	Study effects of feral pig infusion.	Reintroduce predators.	Poison.	Fence water sources.
WILDLIFE		Predators will also prey on native species.	No species specific poison is known.	May keep wildlife from water.
PUBLIC RELATIONS		Local ranchers will resist introduction of any predators.	NPS would likely be subjected to adverse publicity.	
VEGETATION		Possible indirect effects if sufficient native herbivors are preyed upon.	As pigs are eliminated direct impacts on vegetation will also be eliminated. Impact of poisons on other wildlife could lead to indirect impacts due to interrelationships among plants and animals.	
VISITOR USE		Visitor use may increase with the opportunity to serve additional wildlife species.	Effective poisons may present a risk to visitors.	
WATER RESOURCES		Would not curtail pig impacts on water resources.	Poison could find its way into surface waters or aquifers.	
AESTGETUCS				Fencing detracts from natural setting.

FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: FIRE ECOLOGY MONITORING, N-9

NEED FOR THE PROPOSAL: The park developed wide prescriptions under N-6. The vegetative response on past, present and future burns needs to be monitored with respect to timing, intensity and firing patterns. These results could be used to refine prescriptions which encourage reproduction of native species and discourage exotics.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Monitor burns. Use results to refine burning prescriptions.	ALTERNATIVE Continue burning with present prescriptions.	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
VEGETATION	Prescriptions adjusted to encourage reproduction by all native species; best approximation of natural role of fire.	Native species fail to reproduce on some burns; must reinvade from outside burn. Some prescriptions may encourage exotics.			
AETHETICS	Natural chaparral and woodland community structure accessed and preserved.	Burns encouraging different successional patterns add interest to scenery.			
WILDLIFE	Effect of fire on natural forage plants accessed.	Natural forage plants may be eliminated.			
BURN PROGRAM	Additional time required on this project.	Some prescriptions could alter natural flammability patterns.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: WATER RESOURCES MANAGEMENT PLAN, WR-1
NEED FOR THE PROPOSAL: No such inventory exists for Pinnacles, a violation of executive order.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Develop a comprehensive water resources plan.	No action.	React to die-offs.		
WILDLIFE	Indirect impacts on wildlife due to alteration of water resources would be minimized.	Park development could reduce water supply below that needed by some species.	Serious damage to populations could occur before corrective action is taken.		
VISITOR USE	No change.	No change.	Public health could be threatened.		
PARK DEVELOPMENT	Would assist in locating development in areas that least affect water resources.	Insufficient water resources may be available for proposed developments.	No change.		
SOILS	Some temporary soil displacement may be necessary while confirming water sources.	No change.	No change.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: CHALONE CREEK-BEAR CREEK FLOODPLAIN STUDY, WR-2
NEED FOR THE PROPOSAL: Executive Order 11988 requires a floodplain hazard study be conducted prior to additional development. Future development has been identified for the east side of the monument and cannot be implemented until the study is completed.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Complete flood plain study.	No action.			
FACILITIES DEVELOPMENT	Development will be allowed in accordance with monument development plan.	Development plans for the east side would have to be shelved.			
VEGETATION/ WILDLIFE	No direct impacts related to proposal, but some disturbances once floodplain study completed and development is initiated.	No change.			

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: ARCHEOLOGIC RESOURCE PROTECTION, C-1
NEED FOR THE PROPOSAL: Pinnacles has been nominated as an archeological district, and possesses several known sites; more are believed present, but undiscovered as of yet. A program must be implemented to protect this resource.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Selectively survey park; recover surface artifacts.	ALTERNATIVE No action.	ALTERNATIVE Completely survey entire park.	ALTERNATIVE Excavate known sites.	ALTERNATIVE Survey only areas scheduled for burning.
VISITOR USE	Significant finds could result in area closures.	No impact.	Same as proposed action impacts.	Areas being excavated would be closed to the public.	Same as proposed action impacts.
AESTHETICS	No impact.	No impact.	Would probably require removal of some vegetative cover, creating unnatural scene.	Excavation operations would intrude on the natural scene.	No impact.
SOILS	No impact.	No impact.	No impact.	Severe localized soil disturbance.	No impact.
CULTURAL RESOURCES	Subsurface artifacts in areas not surveyed may be lost to natural deterioration; others may be protected.	Probable loss of surface artifacts to "pot hunters."	Increased knowledge of amount and location of cultural resources.	Possible destruction of artifacts by accident or current lack of technique.	Probable loss of surface artifacts to "pot hunters."
WILDLIFE	Possible temporary displacement during artifact collecting.	No impact.	No impact.	Temporary dislocation during excavations.	No impact.
PARK DEVELOPMENT	Monument development plans could be altered	Developments would violate executive order and public law.	Monument development could be altered as a result of study.	No impact.	Development activities would be delayed until additional specific surveys were conducted.

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: HISTORIC SITE PROTECTION, C-2
NEED FOR THE PROPOSAL: Several 19th century homestead ruins exist in the park, containing a large quantity of surface and subsurface artifacts. These sites need to be protected. Early 20th century structures are used for park operations and need to be maintained.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION Continue adaptive use; increase interpretation.	ALTERNATIVE No action.	ALTERNATIVE Fence all sites and structures.	ALTERNATIVE	ALTERNATIVE
VISITOR USE	European man's history in the area will be interpreted to visitors.	New structures will be needed to provide visitor services as historic structures deteriorate.	Visitors will not be allowed the experience of close inspection of homestead ruins.		
AESTHETICS	Visitor experience will be enhanced through the use of buildings which blend into the natural scene.	No impact.	Fencing will not blend into the natural scene.		
SOILS	Some disturbance if subsurface artifacts are recovered.	Some disturbances by illegal "pot hunters."	Localized disturbance to soils.		
CULTURAL RESOURCES	Some deterioration will result from visitor use of the sites.	Ruins will gradually deteriorate and eventually be lost.	Increased protection to some sites.		
WILDLIFE/ VEGETATION	Some disturbance at interpretive sites.	No impact.	Some dislocation during construction.		

MATRIX DISPLAY
FOR RESOURCE MANAGEMENT PLANS

PROJECT STATEMENT TITLE: ARTIFACT COLLECTION AND PRESERVATION, C-3
NEED FOR THE PROPOSAL: Many known artifacts are still in the field and should be collected for their protection, many artifacts already collected are improperly stored and records are not properly maintained.

ALTERNATIVE ACTIONS / IMPACT CATEGORIES	PROPOSED ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Recover surface artifacts selectively.	No action.	Excavate all known sites.	Recover all surface artifacts.	
CULTURAL RESOURCES	Surface artifacts will be cared for but subsurface losses will occur.	Artifacts will be lost through neglect and poor care.	Some artifacts may be damaged in excavation activities.	Subsurface artifacts will continue to deteriorate; significant quantities of worthless items will be retrieved.	
SOILS	Some disturbance while removing artifacts.	No impact.	Severe disturbance.	Some disturbance while removing artifacts.	
AESTHETICS	No impact.	No impact.	Aesthetics may be diminished during excavations.	Ruins would appear sterile.	
INTERPRETATION	Interpretation of man's history at Pinnacles will be improved.	No improvement in monument's interpretive program.	Opportunity to interpret NPS role in preserving culture and history.	Site interpretation would be more difficult without visual reinforcement.	
VISITOR USE	No impact.	No impact.	Areas may be closed or restricted.	No impact.	
WILDLIFE	Some short-term disruption to wildlife.	No impact.	Considerable local disturbance.	Some disruption to wildlife.	
VEGETATION	Short-term minor	No impact.	Considerable	Some localized	

V. CONSULTATION AND COORDINATION

Several sources were consulted for their knowledge of various subjects during the preparation of the Natural and Cultural Resources Management Plan. The following persons made the greatest contributions during preparation: Dr. Vincent Matthews of the University of Northern Colorado, Greeley, Colorado, in historical and physical geology, and William H. Brooks, consulting plant ecologist, Pima College, Tucson, Arizona, in plant ecology and soils. The work of research biologist Peter S. Bennett (CPSU/UA, Tucson, Arizona) was also referred to concerning the general ecology of the monument in the 1976 plan. Dr. Charles Van Riper provided technical guidance in editing the latest plan.

Other agencies and organizations contacted during the preparation of this plan include:

Local Government

Association of Monterey Bay Area Governments
San Benito County Board of Supervisors
Air Quality Control Board

State Government

State of California Resources Agency
- California Department of Fish and Game
- California Division of Forestry
- State Historic Preservation Officer

Federal Government

Department of Agriculture
- U.S. Forest Service
- Soil Conservation Service

Department of the Interior
- Bureau of Land Management
- Fish and Wildlife Service
- Geological Survey

Environmental Protection Agency, Region IX

Others

Audubon Society, Monterey Peninsula
Pinnacles Land and Cattle Company
Salinas Chamber of Commerce
San Benito Chamber of Commerce
Sierra Club, Ventana Chapter
Southwest Parks and Monuments Association
Sportsman's Council of Central California

Informational copies of the plan and environmental assessment will be sent to the following organizations and their comments will be requested. All comments will be reviewed by the Superintendent and considered for implementation. Copies of the final Natural and Cultural Resources Management Plan and Environmental Assessment, plus public comments, will be available at the monument and at the National Park Service, Western Regional Office, San Francisco.

VI. PINNACLES NATIONAL MONUMENT BIBLIOGRAPHY

GENERAL MANAGEMENT

Master Plan for Pinnacles National Monument (1976)
Interpretive Prospectus (1976)
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